EFFECT OF STRESS MANAGEMENT AND RESILIENCE TRAINING (SMART) ON PHYSIOLOGICAL AND PSYCHOLOGICAL PARAMETERS AMONG PATIENTS UNDERGOING HEMODIALYSIS AT SELECTED HOSPITALS – AN INTERVENTIONAL STUDY

Synopsis

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I **Mrs. K. Mageswari,** Part time External Scholar (1905002026) declare that the research work and the thesis on the title **"Effect of stress management and resilience training (SMART) on the levels of blood pressure, fatigue, depression, anxiety, stress and resilience among patients undergoing hemodialysis"** is wholeheartedly done by myself as a part of the work to be submitted to the **SBV University, Puducherry**, under the supervision of **Dr. Helen Shaji J.C, Former Principal**, Shri Sathya Sai College of Nursing, Sri Balaji Vidyapeeth University (DU), Chennai Campus.

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This is to certify that the research work and the thesis on the title **"Effect of stress management and resilience training (SMART) on the levels of blood pressure, fatigue, depression, anxiety, stress and resilience among patients undergoing hemodialysis"** is done by **Mrs. K. Mageswari**, Part time External Scholar (1905002026) as a part of the research work to be submitted to the **SBV University, Puducherry**, as a part of the completion of PhD, has been done under my supervision since September 2020.

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ABSTRACT

Introduction: Chronic kidney disease is considered to be one of the underrecognized public health crisis and it leads to higher risk for early death. Hemodialysis refers to the life-saving treatment for kidney failure. Chronic nature of the disease and long-term treatment with hemodialysis leads to many physiological and psychological issues that eventually results decreased quality of life. Stress management and resilience training (SMART) refers to group of evidence-based interventions that helps to reduce the physical and psychological problems and enhances the resilience of the patients with chronic illnesses. Thus, the study aimed to evaluate the effect of stress management and resilience training (SMART) on the levels of blood pressure, fatigue, depression, anxiety, stress and resilience among patients undergoing hemodialysis.

Methods: A quasi-experimental Pre-test Post- test Control group Interrupted Time Series Design was adopted for the study. Hemodialysis patients were selected from the hemodialysis units of selected study settings by non-probability purposive sampling technique. Among the study participants based on the preset criteria 100 participants were allotted for experimental group and another 100 participants for control group. Pretest done by using the Patient proforma, Automated sphygmomanometer to assess Blood pressure, Multi-dimensional assessment of fatigue scale to assess fatigue, DASS 21 questionairre to assess stress, anxiety, depression and Brief resilience scale to assess resilience of the participants. SMART interventions were given to only experimental group along with routine care and control group received the routine care alone. Posttest were done at the end of the first month, 2nd month and 3rd month with the same tools. 98 participants in the experimental group and 96 participants in the control group have successfully completed the study.

Results: Data were analysed by using the descriptive and analytical statistics. The study revealed that the SMART interventions were effective in reducing the systolic BP (F=16.94, p=0.001), diastolic BP (F=18.97, p=0.001), fatigue (F=28.67, p=0.001), depression (F=20.95, p=0.001), anxiety (F=21.33, p=0.001), stress (F=19.79, p=0.001) and resilience (F=28.71, p=0.001) level of the hemodialysis patients.

Conclusion: The SMART interventions help hemodialysis patients acquire self-care skills that have been shown to be more successful in lowering blood pressure, fatigue, stress, anxiety, depression levels while also enhancing resilience. The study recommends the imparting of SMART interventions as a complementary therapy for hemodialysis patients is very essential to improve the physical and mental wellbeing that enhances the overall quality of life.

Keywords:

Hemodialysis, Chronic Kidney disease, Stress Management and Resilience Training, SMART

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ABBREVIATIONS

1. CKD – Chronic kidney disease
2. HD **-** Hemodialysis
3. SMART – Stress Management and Resilience Training
4. SBP – Systolic Blood pressure
5. DBP – Diastolic blood Pressure
6. NS – Not significant
7. S – Significant
8. MD - Mean difference
9. SD - Standard deviation

CHAPTER I

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Chronic kidney disease (CKD) is a complex clinical syndrome leads to gradual, irreversible, and progressive changes in the structure and/ or function of the kidney. Adult patients with a glomerular filtration rate (GFR) of less than 60 ml/min/1.73 m2 (GFR categories G3a–G5) or greater than 60 ml/min/1.73 m^2 but with signs of renal structural damage for a duration of three months or longer are diagnosed with chronic kidney disease (CKD). (1) Globally, chronic kidney disease (CKD) ranks as the 16th most common cause of years of life lost.(2) By 2040, chronic kidney disease (CKD) will rank fifth globally in terms of years of life lost.(3) An estimated 13.4% (11.7–15.1%) of people worldwide have chronic kidney disease.(4) With the rise in age, obesity, diabetes mellitus, and hypertension, the prevalence of chronic kidney disease (CKD) is rising.(5)

The mainstay of CKD treatments is renal replacement therapy, which includes hemodialysis, peritoneal dialysis, and renal transplantation. Worldwide over 2 million population receive dialysis or renal transplant treatment to stay alive. Hemodialysis is the primary, supportive, life-saving and long-term treatment option for CKD. An extracorporeal circulation of a patient's blood is used in hemodialysis, a therapeutic method, to treat the azotemia, fluid, electrolyte, and acid-base imbalances that are typical of the uremic syndrome.(6) In India, As of 2017 over 130,000 patients are undergoing dialysis, annually about 232 per million population are increasing to get treatment with dialysis and 9–13% of hemodialysis patients pass away within a year.(7,8)

Long time reliance on the dialysis machine, chronic nature of illness, discomfort during hemodialysis, dietary restrictions, changes in body image and physical attributes, restrictions on daily activities and physical activity, frequent hospitalisations, difficulty accessing healthcare providers, high medical and care costs, altered social and familial relationships, lifestyle changes, family and financial burden, feeling of inefficiency and fear of dying are few examples of stressors faced by hemodialysis patients.(9–11) These physical and mental stressors leads to changes in their lifestyle and personality. Research studies aimed at enhancing the resilience of hemodialysis patients are very scarce. Resiliency training and stress management techniques among hemodialysis patients have not received much attention in research studies together in India. In order to lower blood pressure, fatigue, depression, anxiety, and stress levels while also increasing resilience, the researcher in this study combined stress management and resilience building techniques in a novel way by offering hemodialysis patients Stress Management and Resilience Training (SMART).

1.2 AIM

To evaluate the effect of stress management and resilience training (SMART) on the levels of blood pressure, fatigue, depression, anxiety, stress and resilience among patients undergoing hemodialysis.

1.3 OBJECTIVES

- To assess the baseline levels of physiological and psychological parameters among patients undergoing hemodialysis.
- To evaluate the effectiveness of Stress Management and Resilience Training on Physiological and Psychological parameters between experimental and control group.
- To correlate the relationship between the post-test levels of depression, anxiety and stress with resilience in experimental group.
- To associate the post-test levels of fatigue, blood pressure, depression, anxiety, stress and resilience in experimental group with the selected demographic and clinical variables in experimental group.

1.4 RESEARCH HYPOTHESIS

H1 - There is a significant difference between the pretest and post-test levels of blood pressure, fatigue, depression, anxiety, stress and resilience among hemodialysis patients in the experimental group.

H2 - There is a significant difference in the post-test levels of blood pressure, fatigue, depression, anxiety, stress and resilience among hemodialysis patients between experimental and control group.

H3 - There is a significant relationship between the post-test levels of depression, anxiety and stress with resilience in experimental group.

H4 - There is a significant association between the levels of blood pressure, fatigue, depression, anxiety, stress and resilience with their selected demographic and clinical variables in experimental group after Stress Management and Resilience Training among hemodialysis patients.

1.5 OPERATIONAL DEFINITIONS

Effect: It is the result or outcome of Stress Management and Resilience Training in decreasing the levels of blood pressure, fatigue, depression, anxiety, stress and promoting the resilience of hemodialysis patients determined by using Automated Digital Sphygmomanometer, MAF fatigue scale, DASS-21 Rating scale, and Brief Resilience scale.

Stress Management and Resilience Training: It is a group of interventions given to hemodialysis patients that helps to enhance their resilience and decreases the levels of blood pressure, fatigue, depression, anxiety and stress. It includes educational awareness, Healthy renal diet, Deep breathing exercise, Meditation, Passive progressive relaxation exercise and Resilience building techniques.

Physiological parameters: It includes the assessment of blood pressure and fatigue of hemodialysis patients by using Automated Digital Sphygmomanometer and Multidimensional Assessment of Fatigue Scale.

Psychological parameters: It is the assessment of the levels of psychological problems such as depression, anxiety, stress and the resilience among hemodialysis patients by using DASS – 21 Rating scale and Brief Resilience scale.

Hemodialysis patients: Patients who are diagnosed with End stage Renal failure and receives hemodialysis as the maintenance therapy in Hemodialysis Units of selected hospitals, Chennai.

Selected hospitals: In this study the selected hospitals refer to the hospitals which are located in Chennai and doing hemodialysis for the chronic renal failure patients. These selected hospitals are having Hemodialysis Unit with good infrastructural facilities and conducting Hemodialysis for three sessions a day.

Interventional study: Refers to Quasi-experimental study which evaluates the effectiveness of stress management and resilience training on physiological and psychological parameters of the patients who are undergoing hemodialysis.

1.6 ASSUMPTIONS

- Hemodialysis patients have increased levels of blood pressure, fatigue, depression, anxiety, stress and have poor resilience to cope with these physiological and psychological stressors.

- Regular Stress Management and Resilience Training promotes resilience and decreases the levels of blood pressure, fatigue, depression, anxiety and stress among hemodialysis patients.

1.7 DELIMITATIONS

- Study is delimited to the patients with Chronic renal failure and on maintenance hemodialysis.

- Study is delimited to assess only the levels of blood pressure, fatigue, depression, anxiety, stress and resilience of patients undergoing hemodialysis.

- The study is delimited to the selected private hospitals in Chennai only.

- Though the standardized scales are used to determine the fatigue, depression, anxiety, stress and resilience the responses of the participants are subjective.

1.8 CONCEPTUAL FRAMEWORK

The study was designed based on the Weidenbach's Helping Art of Clinical Nursing Theory.

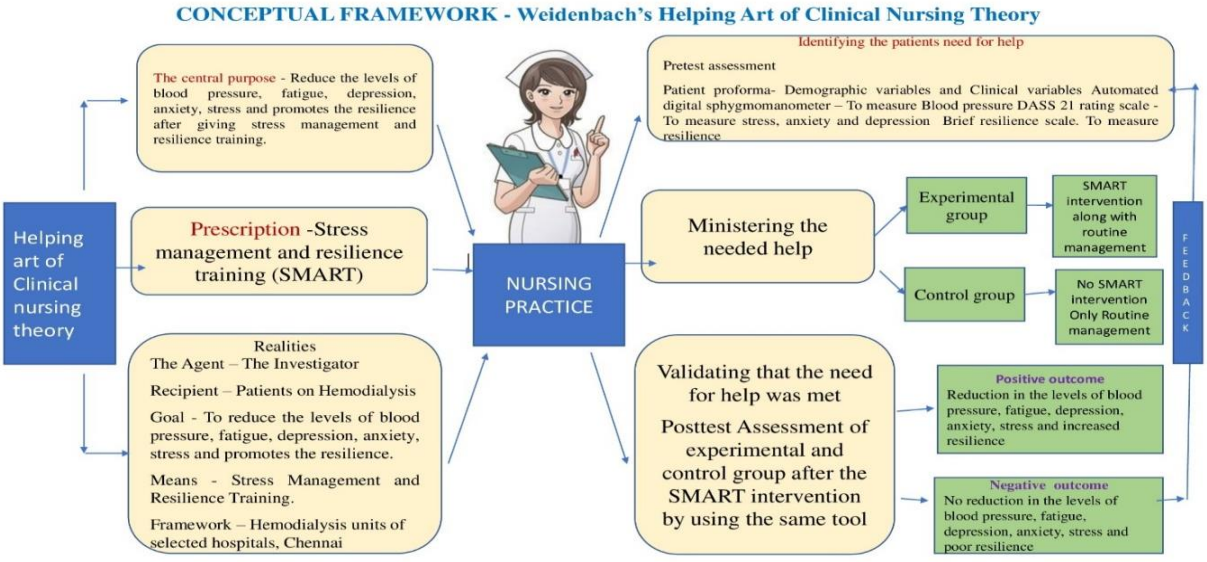
CONCEPTUAL FRAMEWORK - Weidenbach's Helping Art of Clinical Nursing Theory
The central purpose - Reduce the levels of blood pressure, fatigue, depression, anxiety, stress and promotes the resilience after giving stress management and resilience training.
Identifying the patients need for help
Pretest assessment
Patient proforma- Demographic variables and Clinical variables Automated digital sphygmomanometer – To measure Blood pressure DASS 21 rating scale - To measure stress, anxiety and depression Brief resilience scale. To measure resilience
Helping art of Clinical nursing theory
Prescription -Stress management and resilience training (SMART)
NURSING PRACTICE
Ministering the needed help
Experimental group
SMART intervention along with routine management
Control group
No SMART intervention Only Routine management
FEEDBACK
Realities
The Agent – The Investigator
Recipient – Patients on Hemodialysis
Goal - To reduce the levels of blood pressure, fatigue, depression, anxiety, stress and promotes the resilience.
Means - Stress Management and Resilience Training.
Framework – Hemodialysis units of selected hospitals, Chennai
Validating that the need for help was met
Posttest Assessment of experimental and control group after the SMART intervention by using the same tool
Positive outcome
Reduction in the levels of blood pressure, fatigue, depression, anxiety, stress and increased resilience
Negative outcome
No reduction in the levels of blood pressure, fatigue, depression, anxiety, stress and poor resilience

Fig 1.1: Conceptual Framework – Weidenbach's Helping Art of Clinical Nursing Theory

CHAPTER II

LITERATURE REVIEW

The review of literature for the present study is arranged under the following sections:

2.1 Section-A: Literature review related to Prevalence of Chronic Kidney disease across the globe.

Bello AK, et al. (2024) conducted an in-depth literature review and a survey with country level data on chronic kidney disease using the three stages of data collection in 2016, 2018, and 2022. Of 218 nations, 161 had a prevalence of chronic kidney disease (74%), with a global median prevalence of 9·5% (IQR 5·9–11·7). The highest prevalence of chronic renal disease was seen in Eastern and Central Europe (12·8%, 11·9–14·1). Out of 165 countries, 162 (98%) offered chronic hemodialysis, 130 (79%) offered peritoneal dialysis and 116 (70%) offered kidney transplantation. Out of 162 countries, 78 (48%) recognized chronic kidney disease as a health priority. (12)

2.2 Section-B: Literature review related to various physiological and psychological problems of hemodialysis patients.

Hamid Sharif-Nia, et.al (2024) conducted a cross-sectional study among 411 hemodialysis patients between September to October 2023 in Iran. The study revealed that the higher levels of fatigue, thirst distress and Pruritus reduces the quality of life and linked to many complications affecting the overall well-being. Treatment adherence has positive impact on quality of life.(13)

Bansal, et.al (2024) reported that over 80% of patients on maintenance hemodialysis have hypertension, a significant and modifiable risk factor for cardiovascular disease. In the US, approximately half of the over 500,000 people on maintenance hemodialysis for kidney failure will die from cardiovascular causes.(14)

Hanan Mosleh, Meaad Alenezi, Arwa Alsani, Ghadeer Fairaq, Reenad Bedaiwi (2020) conducted a cross-sectional study among 122 patients with CKD and on hemodialysis at King Fahad Hospital in Al-Madinah, Saudi Arabia, from November 2017 to August 2018. Using the Hospital Anxiety and Depression Scale, anxiety and depression were measured. Of the 122 CKD patients, 24.6% had depression and 19.7% had anxiety symptoms. The study found that anxiety and depression are prevalent among CKD patients, particularly among females (P= 0.04) and older patients (P= 0.003).(15)

2.3 Section-C: Literature review related to stress management interventions among Hemodialysis patients.

Cristina J González-Flores, Guillermo Garcia-Garcia, Claudia Lerma,etal., (2023) conducted an experimental research among 64 hemodialysis patients with random sampling method. The control group (n = 29) was intervened with treatment strategies based on a cognitive behavioural intervention (CBI), while the experimental group (n = 35) was intervened with the CBI interventions plus resilience model strategies. Participants were assessed at baseline, 8 weeks later, and after 4 weeks at the end of

the treatment. The results were analysed by ANOVA and Bonferroni-adjusted test method, with $p<0.05$ considered significant. The study results revealed that the resilience model strategies promotes the effectiveness of cognitive behavioural interventions in order to lessen the symptoms of anxiety ($P<0.01$) and depression ($P<0.01$) in the study group.(16)

2.4 Section-D: Literature review related to Stress Management and Resilience Training (SMART) interventions

Edward G Spilg, Hanna Kuk, Lesley Ananny, Kylie McNeill, Vicki LeBlanc, Brent A Bauer, et.al (2022) conducted a randomized controlled trial in 2018–2019, a parallel-group controlled experiment was conducted in which faculty physicians in the Department of Medicine at a large academic tertiary care hospital in Canada were randomized (allocation ratio 1:1). Data collection was collected by using the Connor–Davidson Resilience Scale (CD-RISC), The 4-item Subjective Happiness Scale (SHS), The 10-item Perceived Stress Scale (PSS), The Generalized Anxiety Disorder-7 item (GAD-7) scale at baseline, at the end of 3rd month and at the end of 6 month. Participants in the study arm received Stress Management and Resilience Training intervention with an optional 24-week online program single two-hour in-person workshop and the Control group participants received no intervention. The study revealed that there is a clinically significant differences were observed in stress, anxiety, and resilience among doctors in the intervention group. This proved the effectiveness of SMART programme.(17)

Caitlin E. Loprinzi, Kavita Prasad, Darrell R. Schroeder, Amit Sood (2011) conducted a study to assess the efficacy of Stress Management and Resilience Training (SMART) among 25 breast cancer women. A randomized controlled trial using single blind approach were adopted to assess the perceived stress, anxiety, resilience, and quality of life at baseline and after 12 weeks. The study group received individual and group training sessions on stress management and resilience for 12 weeks, while the control group received a wait list intervention. The results of this feasibility study demonstrated that the study group's perceived stress, anxiety, resilience, and quality of life all improved statistically significant following stress management and resilience training.(18)

2.5 RESEARCH GAP

- Various studies have been done to find the prevalence of hemodialysis and its effect among chronic kidney disease patients.
- Very few studies have been conducted on stress management / stress coping strategies in India among hemodialysis patients.
- Research studies aimed at enhancing the resilience of hemodialysis patients are very scarce. Very few studies have been conducted globally and no study in India regarding resilience building training among hemodialysis patients.
- SMART is the Novel method of combining stress management strategies and resilience building training for hemodialysis patients in India.

CHAPTER III
RESEARCH METHODOLOGY

3.1 RESEARCH APPROACH - Quantitative approach

3.2 RESEARCH DESIGN –The investigator has chosen Pre-test Post- test Control group Interrupted Time Series Design which comes under Quasi-experimental design.

3.3 RESEARCH VARIABLES

Independent Variable: Stress Management and Resilience Training.

Dependent Variable: Physiological and Psychological parameters

Demographic Variables: Age, Gender, Education, Occupation, Monthly family Income, Marital Status, Family size, Family type, History of Habits, Hobbies, Family support, financial sources for treatment, Attenders accompanied during dialysis session, time duration to reach hospital for hemodialysis.

Clinical Variables: Duration of CKD, Duration of treatment on hemodialysis, Frequency of hemodialysis in a week, Vascular access type, History of Co-Morbidities, Family history of chronic renal failure, hypertension, Diabetes and coronary artery disease, Fatigue after HD, Blood Hemoglobin to determine level of Anemia.

Extraneous Variables: Knowledge gained from the health workers/advertisements.

3.4 STUDY SETTING - Hemodialysis units of selected hospitals in Chennai. Data collected from Experimental group in Dr.Kamakshi Memorial Hospital & Apollo Dialysis Clinic, Chennai. Data collected from Control group in Global Hospital & CURI Hospital, Chennai. The above study settings are having well equipped hemodialysis units conducting 3 hemodialysis sessions per day.

3.5 STUDY POPULATION

Target Population: All the patients with Chronic Renal Failure and who were on maintenance hemodialysis between 20 - 70 years of age.

Accessible Population - Patients with Chronic renal failure and who were on maintenance hemodialysis in the selected hospitals in Chennai, aged between 20 to 70 years meeting the inclusion criteria.

Sample: Patients with Chronic renal failure and who were on maintenance hemodialysis in the selected hospitals in Chennai, aged between 20 to 70 years meeting the inclusion criteria and available during the data collection period.

3.6 SAMPLING TECHNIQUE - Non-probability Purposive sampling technique.

Table 3.1: Sampling technique employed in the study

Allocation of study area	Study group selected from Dr. Kamakshi Memorial Hospital & Apollo Dialysis Clinic and Control group selected from Global Hospital & CURI Hospital.		
Selection of study participants	Non-probability Purposive sampling technique followed. According to preset criteria weekly 10 – 15 participants were selected.		
Enrollment of Participants in the study	week	Study Group	Control Group
	First week	Monday, Wednesday, Friday	Tuesday, Thursday, Saturday
	Second week	Tuesday, Thursday, Saturday	Monday, Wednesday, Friday

3.7 SAMPLE SIZE - The estimated sample size was 200. 100 for study group and 100 for control group. Based on the previous study done by Ali Mahdavi et al (2011) the sample size calculated was 100 per group with the 95% confidence interval, 80% power of the study and 15% of drop out.

3.8 SAMPLING CRITERIA

Inclusion Criteria:

- Patients who were diagnosed with chronic renal failure and on maintenance hemodialysis for at least 2 months. Both male and female patients between the age group of 20 to 70 years.
- Patients who could read and understand English or Tamil. Patients who were willing to participate.
- Patients who were not doing any regular exercises like relaxation exercises, meditation including breathing exercises.

Exclusion Criteria

- Patients who were on peritoneal dialysis or underwent kidney transplantation. Patients who were in the terminal stage of their illness.
- Patients who had a previous history of psychiatric disorders or affected with stress other than dialysis in the past 6 months. Patients who diagnosed with dementia, acute psychotic symptoms, and acute suicidal tendency.
- Patients who were not stable and require recurrent admissions due to recurring episodes of hypotension, breathing difficulties & other complications.
- Patients who were having severe and profound hearing loss.

Withdraw Criteria: Participants were allowed to withdraw from the study at any time they feel uncomfortable and could not cooperate for the study. **Rescue Criteria**: Not applicable.

3.9 DATA COLLECTION TOOL - The study included a structured tools with three sections.

- **Section A**: Patient Proforma which includes the Demographic and Clinical Variables.
- **Section B**: Physiologic parameters were assessed by using Automated Digital Sphygmomanometer and Multidimensional assessment of Fatigue scale
- **Section C**: Psychologic parameters were assessed by using DASS 21 Questionnaire and Brief Resilience Scale.

Table 3.2: Data collection Tools

Section	Data Collection Tool	Variables Assessed	Guidelines & Scoring	Reliability & Validity
A.	Patient Proforma	1)Demographic Variables 2)Clinical Variables		
B.	Physiologic Parameters 1)Automated Digital Sphygmomanometer	To assess the level of Blood pressure	International Society of HT 2020 (Global Hypertension Practice Guidelines)(19)	
	2)Multidimensional assessment of Fatigue scale	To assess the level of fatigue. Developed by David Cell, et.al. (1996) 4 domains of fatigue namely-Severity, Distress, Degree of interference in activities of daily living, Timing.	A numerical rating scale with 1 denoting "not at all" and 10 denoting "a great deal." #15-16: 4-point Likert-type scale The overall score ranges from 1 to 50. Global Fatigue Index score -18.7.	It has been demonstrated that the MAF exhibits good internal consistency. (r = 0.93)(20) Test–retest reliability – 0.73. License was obtained through the mail from Mapi Research Trust to use the scale.
C.	Psychologic Parameters 1)DASS-21 Questionnaire	To assess the level of Stress, Anxiety and Depression Developed by Lovibond, P.F., and Lovibond, S.H.	4-point Likert scale Graded as Normal, Mild, Moderate, Severe and Extremely severe. The final score will be determined by multiplying the DASS-21 scores by two.	Cronbach's alpha value for Depression: 0.81 to 0.91, for Anxiety: 0.79 to 0.91, for Stress: 0.80 to 0.90. Test-retest reliability for depression - 0.71 to 0.81, anxiety - 0.74 to 0.81, and stress - 0.81 to 0.89.(21) It is an open tool, and the authors have granted permission for its use.
	Brief Resilience Scale	To assess the level of Resilience. Developed by Smith. et al. (2008)	Graded as Low, Normal and High resilience. Overall score ranges from 6- 30. To determine your final score, divide the total by the number of questions you answered.	The internal consistency of BRS scale α=0.83.(22,23) It is an open tool, and the authors have granted permission for its use.

3.10 VALIDITY & RELIABILITY OF THE TOOL - Content validity was received from 6 medical experts, 4 nursing experts, 2 Clinical psychologists and 1 dietician. Tool reliability was assessed with test-retest method. The main study tool was updated with experts' recommendations.

3.11 PILOT STUDY - Pilot study was conducted at Dr. Kamakshi memorial hospital, Chennai during the period of Dec 2021 to March 2022 with 20 samples (10% of the main study sample size). The study was found feasible. Study centre was cooperative to carry out the main study. Tools were reliable and found feasible. The samples used in the pilot was excluded for the main study. There were no major modifications done in the tool after pilot study.

3.12 DATA COLLECTION PROCEDURE - Data collection was commenced in the Hemodialysis units of selected hospitals, Chennai after obtaining the Institutional Ethical Committee clearance and formal permission was obtained from selected hospital authorities from October 2023 to June 2024. The study focused on maintenance hemodialysis patients between the age group of 20 to 70 years at four areas – Study group from Dr. Kamakshi Memorial Hospital & Apollo Dialysis Clinic and Control group from Global Hospital & CURI Hospital.

STEP 1: **Enrollment of Participants**: Samples were enrolled in the study according to preset criteria and after obtaining their written consent. Non-probability purposive sampling technique used to select the samples in the experimental and control group. 222 samples were assessed for eligibility for study and among that 22 were excluded from the study due to not meeting the inclusion criteria. Finaly 200 samples were enrolled for the study. Among them 100 samples in experimental group and another 100 samples in control group were allotted. In a week 10 to 15 samples were selected to participate in the study.

STEP 2: **Pretest:** Pretest was done by collecting the patient proforma, blood pressure was assessed by using Automated Digital Sphygmomanometer, fatigue was assessed by using Multidimensional assessment of fatigue scale, depression, anxiety and stress assessed by using DASS-21 Questionnaire and resilience assessed by Brief Resilience Scale for 30 minutes after explaining about the tool.

STEP 3: **Intervention: Experimental Group** - Stress management and resilience building interventions were given to the experimental group participants alone with routine care for 45 minutes a day for 3 days in a week for one month as one to one individual session. SMART interventions have been discussed in Table 3.3. Interventions were delivered to the patients when their vital signs and physical condition were stable by using Audios and videos with multimedia facilities such as Laptops, iPads and Mobile phones, Researcher-made Guide - “A PATIENT HOLISTIC GUIDE TO HEMODIALYSIS CARE”, through lectures, direct demonstrations, redemonstrations, interactive discussions, and homework. Daily checklist booklet was maintained to assess the performance of the participants. The intervention group received totally 12 sessions of training workshops on SMART for 1 month. **Control Group** - The control group participants did not receive

SMART intervention and the samples were on routine care. 98 samples in the experimental group and 96 samples in the control group have completed the interventional period successfully.

Step 4: **Post-test**: Post-test were done at the end of 1 month (Post-test 1), 2nd month (Post-test 2) and 3rd month (Post-test 3) by using the same tools for both the groups. Number of participants in Post-test 1, 2 & 3 were 98 in the study group and 96 in the control group respectively.

Step 5: **Follow -up:** During follow-up the samples in the intervention group were promoted to follow the interventions. The samples were followed directly, through weekly text messages and phone calls to practice the interventions. Samples were advised to follow the daily diary checklist also. Follow up continued till the completion of the study. Reinforcement was given during 6th week and 10th week.

Step 6: **Control Group:** Wait list interventions were given to the control group once after the data collection over. During wait list intervention the samples in the control group was supported with Researcher made Guide "A Patient Holistic Guide to Hemodialysis Care" along with education.

Table 3.3: SMART Intervention

DAY	INTERVENTION	METHODS	TIME DURATION	RESEARCHER ACTIVITY	SESSION	HOME ASSIGNMENT
1	Education about Chronic Kidney Disease, Hemodialysis, and Importance of SMART	Video - Assisted Teaching	30 Minutes	Discussion/ Researcher made Guide - "A Patient Holistic Guide to Hemodialysis Care"	During Hemodialysis	-
	Diaphragmatic Deep breathing exercise	Audio - Assisted Teaching	5 minutes (10 counts)	Demonstration/ Discussion	Before Hemodialysis	Daily practice
	Mindfulness meditation – 5 senses grounding	Audio - Assisted Teaching	10 mins	Demonstration/ Discussion	Before Hemodialysis	Weekly twice practice
Day 2	Education about Healthy Lifestyle – Healthy Renal diet and Mindfulness eating	Counselling	30 minutes	Demonstration/ Discussion/Counselling/ Researcher made Guide- "A Patient Holistic Guide to Hemodialysis Care"	During Hemodialysis	Daily practice
	Diaphragmatic Deep breathing exercise	Audio - Assisted Teaching	5 minutes (10 counts)	Demonstration/ Discussion	Before Hemodialysis	Daily practice
	Passive Progressive relaxation exercise	Audio - assisted teaching	10 mins	Demonstration/ Discussion	Before Hemodialysis	Weekly twice practice

Day 3	Education on Resilience building techniques	Counselling	30 minutes	Discussion/ Counselling/ Researcher made Guide- "A Patient Holistic Guide to Hemodialysis Care"	During Hemodialysis	Daily practice
	Diaphragmatic Deep breathing exercise	Audio - Assisted Teaching	5 minutes (10 counts)	Demonstration/ Discussion	Before Hemodialysis	Daily practice
	Body scanning Meditation	Audio - assisted teaching	10 mins	Demonstration/ Discussion	Before Hemodialysis	Weekly twice practice

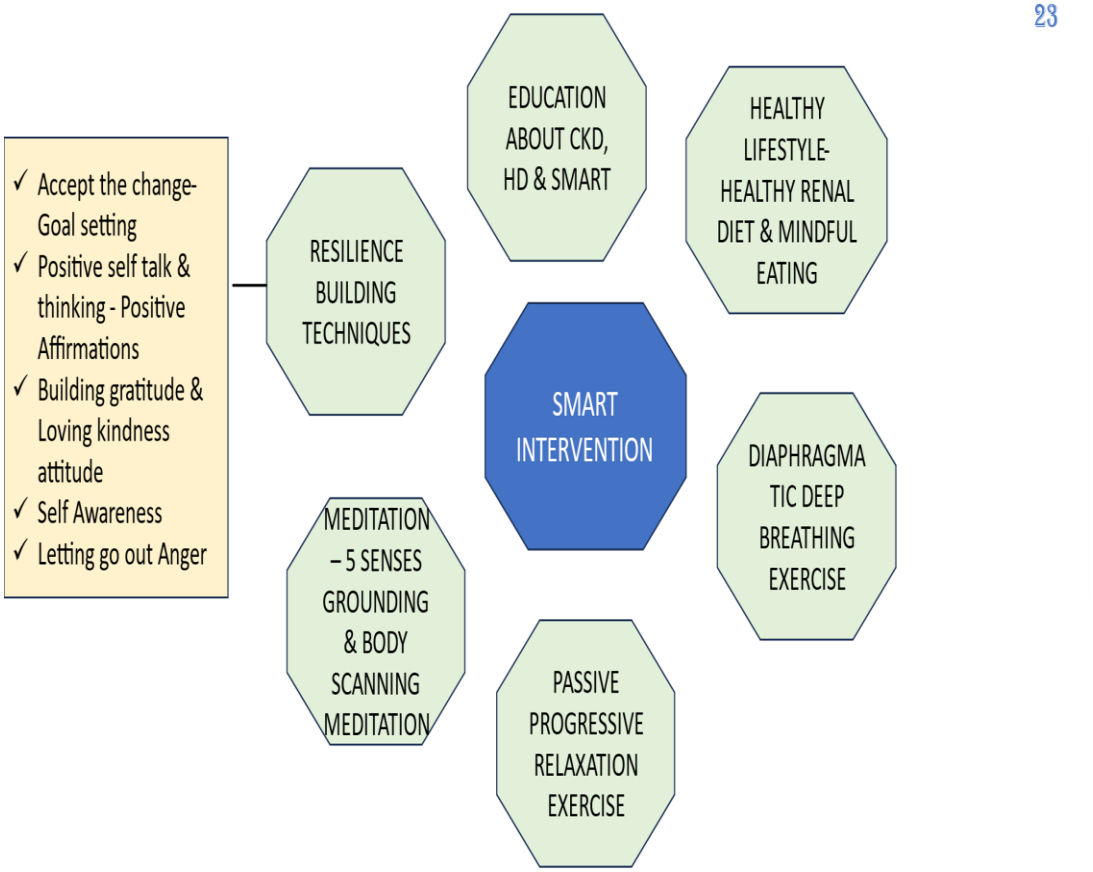
✓ Accept the change- Goal setting
✓ Positive self talk & thinking - Positive Affirmations
✓ Building gratitude & Loving kindness attitude
✓ Self Awareness
✓ Letting go out Anger
RESILIENCE BUILDING TECHNIQUES
EDUCATION ABOUT CKD, HD & SMART
HEALTHY LIFESTYLE- HEALTHY RENAL DIET & MINDFUL EATING
SMART INTERVENTION
DIAPHRAGMATIC DEEP BREATHING EXERCISE
MEDITATION – 5 SENSES GROUNDING & BODY SCANNING MEDITATION
PASSIVE PROGRESSIVE RELAXATION EXERCISE

Fig 3.1: Stress Management and Resilience Training Intervention

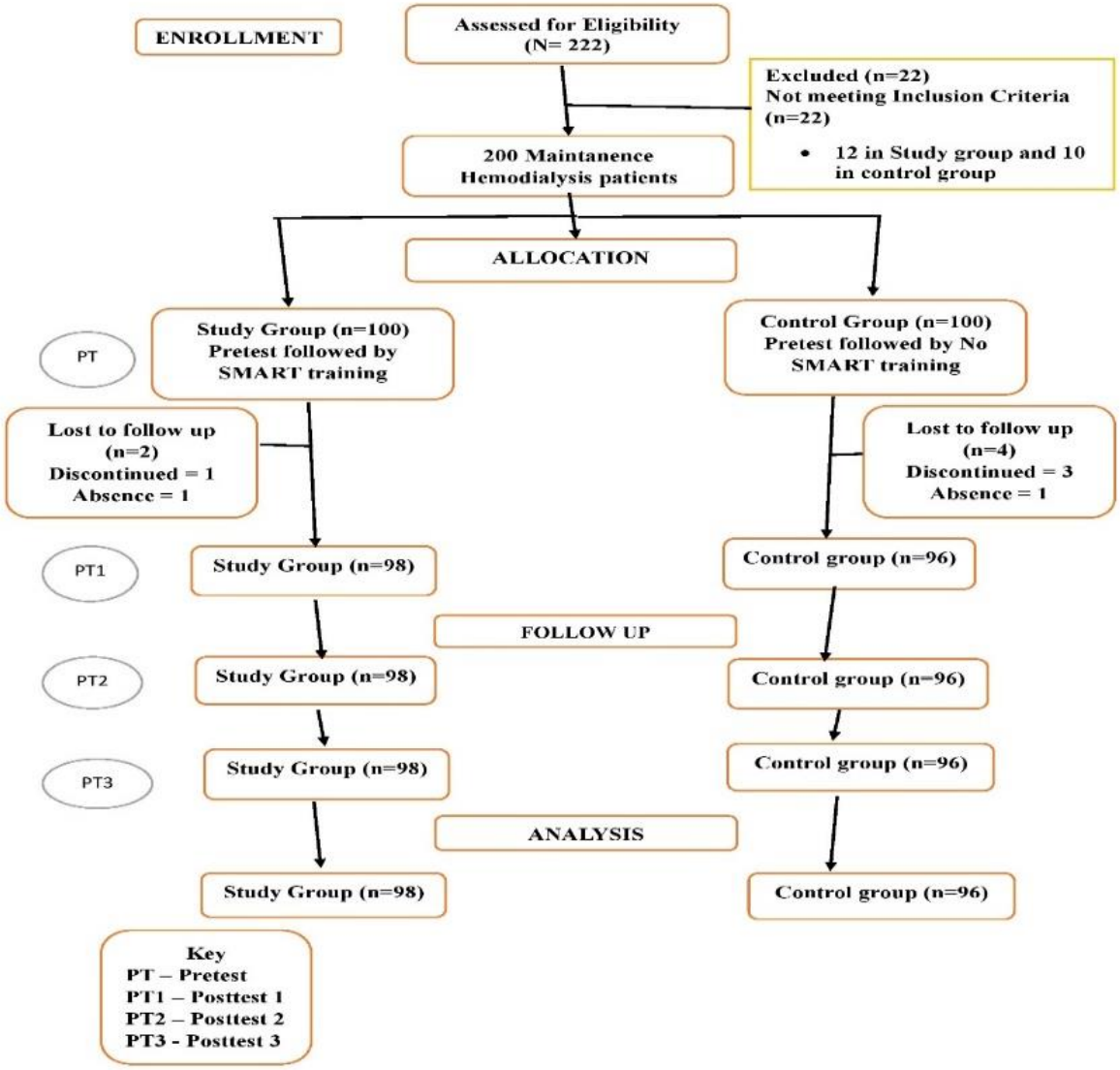

Fig 3.2: TREND Diagram of the Sampling applied in the study

3.13 DROP OUT ANALYSIS

Table 3.4 Drop out analysis of the sample

S.No	Content	Study Group		Control Group	
		n	%	n	%
1	NO OF DROP OUTS	2	2	4	4
ANALYSIS OF THE DROP OUTS IN FREQUENCY AND PERCENTAGE					
Study Group reasons	**NUMBER**	**%**	**Control Group reasons**	**NUMBER**	**%**
Absence for more than 2 sessions	1	1	Absence for more than 2 sessions	1	1
Migrated	1	1	Migrated	2	2
-	-	-	Died	1	1
Total	**2**	**2**	**Total**	**4**	**4**

3.14 QUALITY ASSUARANCE OF THE INTERVENTION - Quality of the Intervention was monitored by the medical officer (Nephrologist) or Dialysis in-charge of each setting. Intervention fidelity of the study was done by the medical officer for assuring the quality.

3.15 ETHICAL CONSIDERATION –The study was scrutinised for ethical concerns in the Institutional Ethical Committee at Dr. Kamakshi Memorial Hospital (IEC Approval NO: 07/IEC/2021). Permission was obtained from the authorities of the study settings to conduct the study. All ethical considerations for the participants were ensured. Participants confidentiality was ensured. Informed consent was obtained from the participants. Participants were given rights to withdraw from the study at any time. Homogeneity was maintained with regard to the sex and hypertension in both the groups. Control group was provided with Wait list intervention.

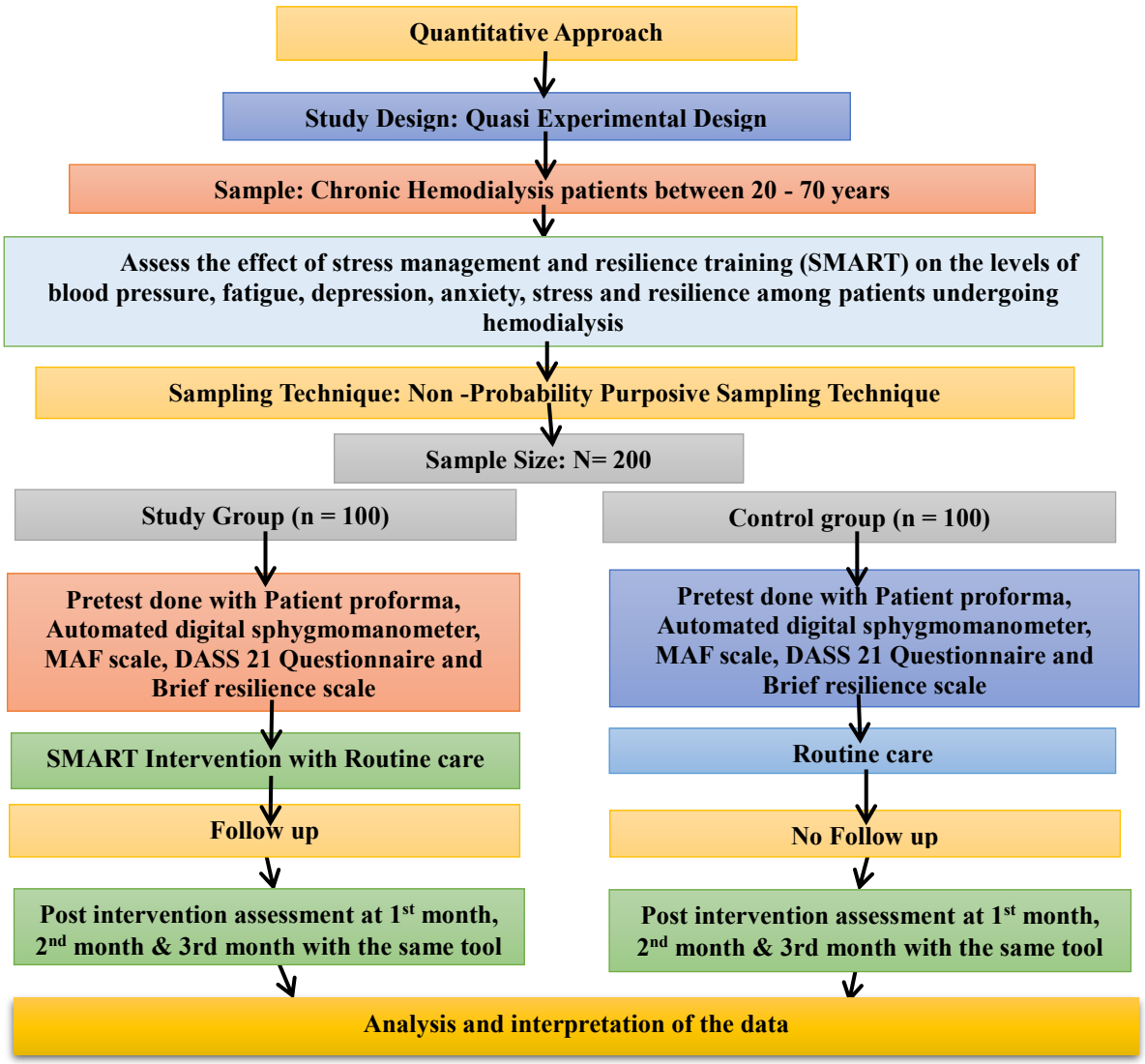
Quantitative Approach
Study Design: Quasi Experimental Design
Sample: Chronic Hemodialysis patients between 20 - 70 years
Assess the effect of stress management and resilience training (SMART) on the levels of blood pressure, fatigue, depression, anxiety, stress and resilience among patients undergoing hemodialysis
Sampling Technique: Non -Probability Purposive Sampling Technique
Sample Size: N= 200
Study Group (n = 100)
Control group (n = 100)
Pretest done with Patient proforma, Automated digital sphygmomanometer, MAF scale, DASS 21 Questionnaire and Brief resilience scale
Pretest done with Patient proforma, Automated digital sphygmomanometer, MAF scale, DASS 21 Questionnaire and Brief resilience scale
SMART Intervention with Routine care
Routine care
Follow up
No Follow up
Post intervention assessment at 1st month, 2nd month & 3rd month with the same tool
Post intervention assessment at 1st month, 2nd month & 3rd month with the same tool
Analysis and interpretation of the data

Fig.3.3 Schematic Representation of the Methodology of the Study

CHAPTER IV
DATA ANALYSIS & INTERPRETATION

This chapter covers a thorough analysis of the study's findings. The results have been explained in different sections according to the study objectives.

Section 1 - Distribution of Demographic and Clinical Variables among patients undergoing hemodialysis in Experimental and control group.

Table 4.1: Description of the Demographic variables of the participants in the study and control group in Pretest

Demographic variables		Group				Chi square test
		Experimental(n=100)		Control(n=100)		
		n	%	n	%	
Age	20-30 years	0	0.00%	0	0.00%	$\chi 2=1.49$ p=0.68(NS)
	31-40 years	8	8.00%	11	11.00%	
	41-50 years	25	25.00%	27	27.00%	
	51-60 years	31	31.00%	24	24.00%	
	61-70 years	36	36.00%	38	38.00%	
Gender	Male	71	71.00%	71	71.00%	$\chi 2=0.00$ p=1.00(NS)
	Female	29	29.00%	29	29.00%	
Education	No formal education	36	36.00%	41	41.00%	$\chi 2=0.62$ p=0.74(NS)
	Primary/Middle/High school education	31	31.00%	27	27.00%	
	Higher secondary school education / Diploma	33	33.00%	32	32.00%	
	Degree and above	0	0.00%	0	0.00%	
Occupation	Actively employed	23	23.00%	25	25.00%	$\chi 2=1.39$ p=0.50(NS)
	Unemployed / Homemaker	52	52.00%	44	44.00%	
	Unemployed / Homemaker	25	25.00%	31	31.00%	
Monthly Family Income (Rs)	Below Rs.20,000/-	41	41.00%	45	45.00%	$\chi 2=1.08$ p=0.78(NS)
	Rs.20,001-30,000/-	30	30.00%	24	24.00%	
	Rs.30,001-40,000/-	11	11.00%	10	10.00%	
	Above Rs.40,000/-	18	18.00%	21	21.00%	
Marital status	Married	90	90.00%	89	89.00%	$\chi 2=0.43$ p=0.81(NS)
	Unmarried	6	6.00%	8	8.00%	
	Widow/ Widower	4	4.00%	3	3.00%	
	Divorced / Separated	0	0.00%	0	0.00%	
Family size	<3	34	34.00%	26	26.00%	$\chi 2=1.78$ p=0.41(NS)
	3-6	59	59.00%	68	68.00%	
	7-9	7	7.00%	6	6.00%	
	>9	0	0.00%	0	0.00%	
Family type	Nuclear family	69	69.00%	67	67.00%	$\chi 2=1.25$ p=0.54(NS)
	Joint family	26	26.00%	24	24.00%	

	Three generation family	5	5.00%	9	9.00%	
Habits smoking	No	70	70.00%	79	79.00%	$\chi 2=2.13$
	Yes	30	30.00%	21	21.00%	p=0.14(NS)
Alcoholic	No	66	66.00%	71	71.00%	$\chi 2=0.58$
	Yes	34	34.00%	29	29.00%	p=0.45(NS)
Chewing tobacco	No	97	97.00%	93	93.00%	$\chi 2=1.68$
	Yes	3	3.00%	7	7.00%	p=0.19(NS)
Recreational drugs	No	98	98.00%	97	97.00%	$\chi 2=0.21$
	Yes	2	2.00%	3	3.00%	p=0.65(NS)
Hobbies	No	21	21.00%	23	23.00%	$\chi 2=0.12$
	Yes	79	79.00%	77	77.00%	p=0.73(NS)
Family support	No	9	9.00%	15	15.00%	$\chi 2=1.71$
	Yes	91	91.00%	85	85.00%	p=0.19(NS)
Financial sources for treatment	Sponsored	7	7.00%	12	12.00%	$\chi 2=2.93$
	Self	24	24.00%	30	30.00%	p=0.23(NS)
	Insurance	69	69.00%	58	58.00%	
Attender accompanied during dialysis	No	34	34.00%	32	32.00%	$\chi 2=3.16$
	Yes	56	56.00%	64	64.00%	p=0.21(NS)
	Occasional	10	10.00%	4	4.00%	
Time duration to reach hospital for HD	Less than 1 hour	68	68.00%	76	76.00%	$\chi 2=1.72$
	1-2 hours	29	29.00%	21	21.00%	p=0.42(NS)
	More than 2 hours	3	3.00%	3	3.00%	

NS= Not Significant

Interpretation: Table 4.1 represents the demographic details of the participants in the study and control groups. Key findings include: Majority 36% in the study group and 38% in the control group were aged between 61-70 years and 71% are males and 29% are females in both the groups respectively. About 36% of the study group and 41% of the control group do not have any formal education. Majority participants were homemakers/ unemployed (52% in the study group and 44% in the control group). Majority 90% in the study group and 89% in the control group were married. About 69% in the study group and 67% in the control group lives in nuclear family. Approximately 30% in the study group and 21% in the control group had smoking history, 34% in the study group and 29% in the control group had Alcoholic history. About 91% in the study group and 85% in the control group had good family support. Majority 69% in the study group and 58% in the control group had undergone the hemodialysis treatment under Insurance. Major 68% in the study group and 76% in the control group had the travelling time to reach hospital is less than an hour. There is no significant difference between study group and control group which shows that both the groups are homogenous in nature.

Table 4.2: Description of the Clinical variables of the participants in the study and control group in Pretest

Clinical variables		Group				Chi square test
		Experimental(n=100)		Control(n=100)		
		n	%	n	%	
Duration of CKD	< 1 year	45	45.00%	37	37.00%	$\chi2$=3.00 p=0.39(NS)
	1 - 5 years	44	44.00%	44	44.00%	
	6 – 10 years	7	7.00%	11	11.00%	
	> 10 years	4	4.00%	8	8.00%	
Duration of treatment on haemodialysis	Less than a year	62	62.00%	50	50.00%	$\chi2$=6.08 p=0.11(NS)
	1-3years	25	25.00%	37	37.00%	
	4-6 years	9	9.00%	5	5.00%	
	More than 6 years	4	4.00%	8	8.00%	
Frequency of haemodialysis in a week	Once in a week	0	0.00%	0	0.00%	$\chi2$=1.31 p=0.52(NS)
	Twice in a week	46	46.00%	38	38.00%	
	Thrice in a week	54	54.00%	62	62.00%	
Type of vascular access	Arteriovenous Fistula	84	84.00%	79	79.00%	$\chi2$=2.60 p=0.45(NS)
	Arteriovenous Graft	1	1.00%	4	4.00%	
	Tunnelled central venous catheter	13	13.00%	16	16.00%	
	Non- tunnelled catheter	2	2.00%	1	1.00%	
History of Co-Morbidities- Diabetes	No	57	57.00%	58	58.00%	$\chi2$=0.02 p=0.88(NS)
	Yes	43	43.00%	42	42.00%	
History of Co-Morbidities- Hypertension	No	34	34.00%	34	34.00%	$\chi2$=0.00 p=1.00(NS)
	Yes	66	66.00%	66	66.00%	
History of Co-Morbidities- COPD/Asthma	No	96	96.00%	93	93.00%	$\chi2$=0.87 p=0.35(NS)
	Yes	4	4.00%	7	7.00%	
History of Co-Morbidities- Coronary Artery Disease	No	87	87.00%	89	89.00%	$\chi2$=0.19 p=0.67(NS)
	Yes	13	13.00%	11	11.00%	
Family history of chronic renal failure	No	86	86.00%	90	90.00%	$\chi2$=0.76 p=0.38(NS)
	Yes	14	14.00%	10	10.00%	
Fatigue after hemodialysis	No Fatigue	24	24.00%	23	23.00%	$\chi2$=3.09 p=0.69(NS)
	Less than 1 hour	36	36.00%	37	37.00%	
	1-2 hours	29	29.00%	22	22.00%	
	> 2 hours – 3 hours	3	3.00%	6	6.00%	
	> 3 hours – 4 hours	5	5.00%	6	6.00%	
	> 4 hours	3	3.00%	6	6.00%	
Blood Hemoglobin to determine the level of Anemia	Non-Anemic	15	15.00%	10	10.00%	$\chi2$=3.99 P=0.26 (NS)
	Mild Anemic	8	8.00%	11	11.00%	
	Moderate Anemic	70	70.00%	65	65.00%	
	Severe Anemic	7	7.00%	14	14.00%	

NS= Not Significant

Interpretation: Table 4.2 represents the Clinical variables details of the participants in the study and control groups. Key findings include: About 45% in the study group and 37% in the control group had CKD for less than a year and majority 62% in the study group and 50% in the control group were undergoing treatment on Hemodialysis for less than a year. Approximately 54% in the study group and 62% in the control group had undergoing hemodialysis thrice in a week and 84% in the study group and 79% in the control group had Arterio-venous fistula. Related to Co-Morbidities: About 43% in the study group and 42% in the control group had Diabetes, 66% in both the groups had hypertension, 13% in the study group and 11% in the control group had Coronary Artery disease, 4% in the study group and 7% in the control group had COPD/ Asthma, 2% in the study group and 3% in the control group had Cancer respectively. Approximately14% in the study group and 10% in the control group had family history of chronic renal failure, 39% in the study group and 31% in the control group had family history of hypertension, 48% in the study group and 44% in the control group had family history of diabetes, 10% in the study group and 8% in the control group had family history of Coronary Artery disease respectively. Majority 36% in the study group and 37% in the control group perceive fatigue for less than an hour after hemodialysis. Majority 70% in the study group and 65% in the control group had moderate level of Anemia. Chi-square test indicated that there is no significant difference between the groups with the above variables.

Section 2: Description of the Pretest level of Physiological and Psychological variables of the participants in the study and control group in Pretest.

Table 4.3: Description of the level of Physiological variables (Blood Pressure and Fatigue) of the participants in the study and control group in Pretest.

Physiological Variables		Group				Chi square test
		Experimental(n=98)		Control(n=96)		
		n	%	n	%	
Systolic BP	Normal BP	18	18.37%	17	17.71%	$\chi2=0.68$ p=0.75 (NS)
	High normal BP	20	20.41%	17	17.71%	
	Grade 1 HT	29	29.59%	31	32.29%	
	Grade 2 HT	25	25.51%	23	23.96%	
	Hypertensive Crisis	6	6.12%	8	8.33%	
Diastolic BP	Normal BP	47	47.96%	53	55.21%	$\chi2=3.30$ p=0.51 (NS)
	High normal BP	13	13.27%	6	6.25%	
	Grade 1 HT	17	17.35%	19	19.79%	
	Grade 2 HT	18	18.37%	15	15.63%	
	Hypertensive Crisis	3	3.06%	3	3.13%	
Level of Fatigue	Patients with Fatigue (GFI >18.7)	57	58.16%	65	67.71%	$\chi2=1.89$ p=0.17 (NS)
	Patients without Fatigue (GFI <18.7)	41	41.84%	31	32.29%	

Degree of fatigue changed during the past week	Increased	6	6.12%	4	4.17%	$\chi 2$=1.44 p=0.69 (NS)
	Fatigue has gone up and down	27	27.55%	21	21.87%	
	Stayed the same	40	40.82%	45	46.88%	
	Decreased	25	25.51%	26	27.08%	

NS= Not Significant

Interpretation: Table 4.3 represents the distribution of Pretest level of Physiological variables of the participants in the study and control group. Key findings include: **Physiological variables: Blood Pressure:** Majority 29.59% in the study group and 32.29% in the control group had Grade 1 Systolic Hypertension. Majority 47.96% in the study group and 55.21% in the control group had normal Diastolic blood pressure. **Fatigue:** Approximately 58.16% in the study group and 67.71% in the control group had fatigue. Chi-square test indicated that there is no significant difference between the groups across all the above variables.

Table 4.4: Description of the level of Psychological variables (Depression, Anxiety, Stress and Resilience) of the participants in the study and control group in Pretest

Psychological Variables		**Group**				**Chi square test**
		Experimental(n=98)		**Control(n=96)**		
		n	**%**	**n**	**%**	
Level of Depression	Normal	27	27.55%	26	27.08%	$\chi 2$=3.17 p=0.53 (NS)
	Mild	18	18.37%	16	16.67%	
	Moderate	24	24.49%	26	27.08%	
	Severe	18	18.37%	11	11.46%	
	Extremely severe	11	11.22%	17	17.71%	
Level of Anxiety	Normal	19	19.39%	20	20.83%	$\chi 2$=3.89 p=0.42 (NS)
	Mild	10	10.20%	15	15.63%	
	Moderate	21	21.43%	26	27.08%	
	Severe	25	25.51%	16	16.67%	
	Extremely severe	23	23.47%	19	19.79%	
Level of Stress	Normal	40	40.81%	39	40.63%	$\chi 2$=3.34 p=0.50 (NS)
	Mild	14	14.29%	20	20.83%	
	Moderate	23	23.47%	14	14.58%	
	Severe	18	18.37%	20	20.83%	
	Extremely severe	3	3.06%	3	3.13%	
Level of Resilience	Low	47	47.96%	42	43.75%	$\chi 2$=0.36 p=0.84 (NS)
	Normal	44	44.90%	47	48.96%	
	High	7	7.14%	7	7.29%	

NS= Not Significant

Interpretation: Table 4.4 represents the distribution of Pretest level of Psychological variables of the participants in the study and control group. Key findings include: **Pychological variables**: About 24.49% in the study group and 27.08% in the control group had moderate level of Depression, 25.51% in the study group had severe anxiety and 27.08% in the control group had moderate level of anxiety, 23.47% in the study group moderate level of stress and 20.83% in the control group had severe level of stress, 47.96% in the study group and 43.75% in the control group had low level of Resilience respectively. Chi-square test indicated that there is no significant difference between the groups across all the above variables.

Section 3 - Effectiveness of SMART on Physiological Variables among patients on Hemodialysis in the experimental and control group.

Table 4.5: Comparison of Mean value of Physiological Variables during Pretest, Posttest-I, Posttest-II and Posttest - III between experimental and control group of patients undergoing hemodialysis

Physiological Variables		Group				MD	Student independent t=test
		Experimental (n=98)		Control (n=96)			
		Mean	SD	Mean	SD		
Systolic BP score (SBP)	Pretest	146.03	21.56	145.87	21.10	0.16	t=0.05 P=0.96 DF=192 (NS)
	Post-test-I	140.10	20.72	145.15	19.81	-5.05	t=1.73 P=0.09 DF=192 (NS)
	post-test-II	138.45	18.29	145.44	21.97	-6.99	**t=2.41P=0.05* DF=192 (S)**
	Post test-III	136.77	19.63	144.94	22.68	-8.17	**t=2.68 P=0.01** DF=192 (S)**
	Oneway Repeated measures ANOVA F-test	**MD =9.26 F=16.94 p=0.001*** (S)**		**MD=0.93 F=0.07 p=0.98 (NS)**			
Diastolic BP score (DBP)	Pretest	86.20	9.23	85.31	8.97	-0.89	t=0.68 P=0.50 DF=192 (NS)
	Post-test-I	83.68	10.50	84.82	9.70	1.14	t=0.79 P=0.43 DF=192 (NS)
	post-test-II	81.68	9.87	84.68	10.31	3.00	**t=2.07P=0.05* DF=192 (S)**
	Post test-III	79.79	10.30	84.72	10.80	4.93	**t=3.25 P=0.001*** DF=192 (S)**
	Oneway Repeated measures ANOVA F-test	**MD= 6.41 F=18.97 p=0.001*** (S)**		**MD=0.59 F=0.15 p=0.93 (NS)**			
Fatigue score	Pretest	23.24	7.86	23.81	9.21	-0.57	t=0.46 P=0.65 DF=192 (NS)
	Post-test-I	21.56	7.91	23.82	9.31	-2.26	t=1.82 P=0.07 DF=192 (NS)
	Post-test-II	19.05	7.45	23.92	9.87	-4.87	**t=3.88P=0.001*** DF=192 (S)**
	Post-test-III	16.46	6.74	23.61	9.74	-7.15	**t=5.96 P=0.001*** DF=192 (S)**
	Oneway Repeated measures ANOVA F-test	**MD = 6.78 F=28.67 p=0.001*** (S)**		**MD=0.20 F=0.34 p=0.73 (NS)**			

MD = Mean Difference, SD = Standard Deviation
P>0.05 is not significant, NS = Not significant, S= Significant

Interpretation – The above table describes the mean scores of the Physiological variables (SBP, DBP, Fatigue) and the testing of hypothesis using student independent t test. It demonstrates that all physiological variables in the study group accept the research hypothesis, indicating that there is a significant difference in SBP (t=2.68, P=0.01), DBP (t=3.25 P=0.001), and fatigue (t=5.96, P=0.001) between the study and control groups. It proves the effectiveness of the SMART training.

In experimental group, Repeated measures F-test analysis shows that, mean overall Physiological variables score is statistically significant different between pre-test and post-test-III of SBP (F=16.94, p=0.001***), DBP F=18.97, p=0.001***) and Fatigue F=28.67, p=0.001***). Similarly, in control group, Repeated measures F-test analysis shows that, mean overall Physiological variables score is not statistically significant different between pre-test and post-test-III of SBP (F=0.07, p=0.98), DBP (F=0.15, p=0.93) and Fatigue (F=0.34, p=0.73). Therefore, we can conclude that a Stress Management and Resilience Training (SMART) reduces significantly Physiological variables score among hemodialysis patients.

The below mentioned Line Graphs Fig 4.1 – Fig 4.3) describes the mean score of the Physiological parameters between study and control group in Pretest, Post test I, II & III on Hemodialysis in the experimental and control group.

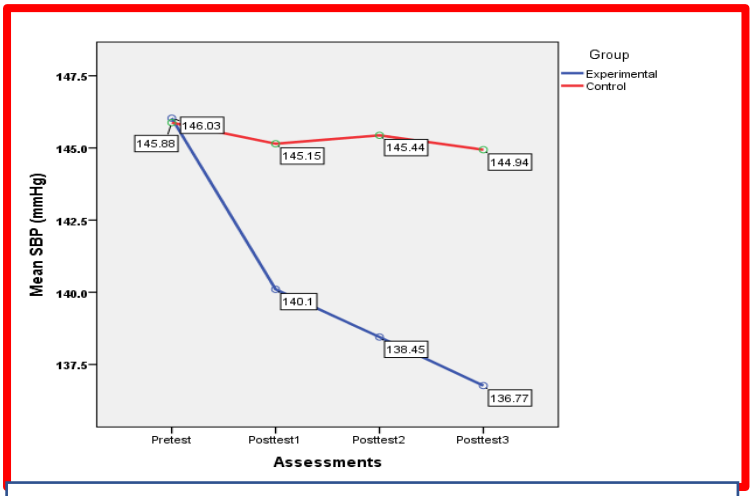

Fig 4.1 Comparison of mean SBP reduction scores between the experimental and control group in Pretest, Posttest I, II, III

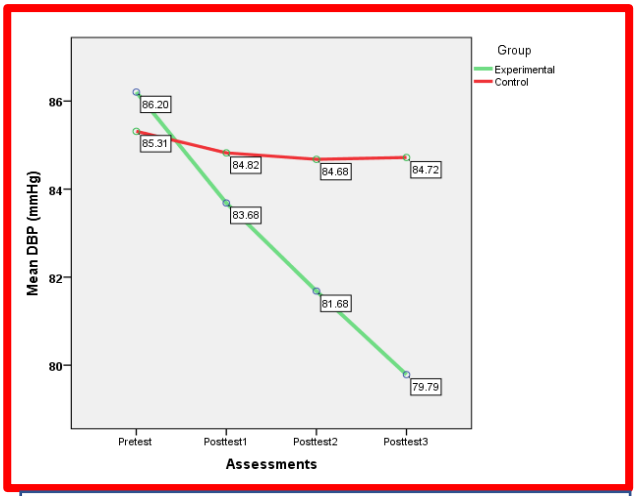

Fig 4.2 Comparison of mean DBP reduction scores between the experimental and control group in Pretest, Posttest I, II, III

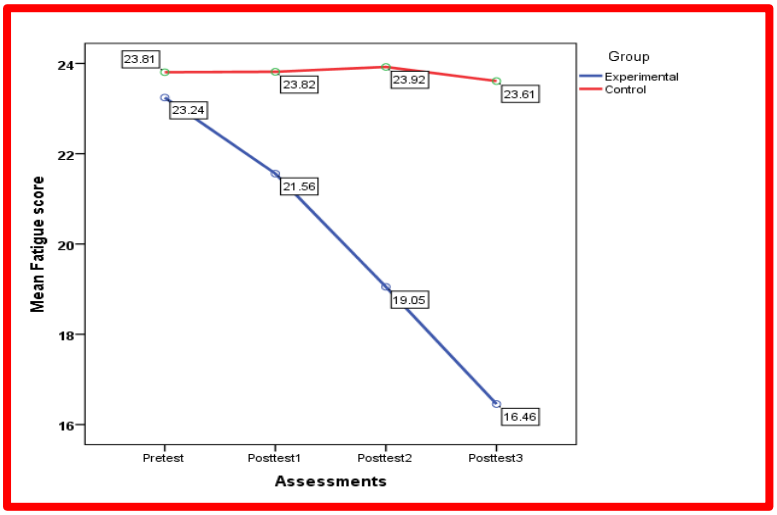

Fig 4.3 Comparison of mean fatigue reduction scores between the experimental and control group in Pretest, Posttest I, II, III

Section 4 - Effectiveness of SMART on Psychological Variables among patients on Hemodialysis in the experimental and control group

Table 4.6: Comparison of Mean value of Psychological Variables during Pretest, Posttest-I, Posttest-II and Posttest - III between experimental and control group

Psychological Variables		Group				MD	Student independent t=test
		Experimental (n=98)		Control (n=96)			
		Mean	SD	Mean	SD		
Depression score	Pretest	20.80	9.56	20.33	8.84	0.47	t=0.35 P=0.73 DF=192 (NS)
	Posttest-I	17.85	8.00	20.21	9.18	-2.36	t=1.91 P=0.06 DF=192 (NS)
	Post-test-II	15.65	7.04	20.19	9.37	-4.54	**t=3.81P=0.001*** DF=192 (S)**
	Post-test-III	13.57	7.64	19.63	9.03	-6.06	**t=5.05 P=0.001*** DF=192 (S)**
	Oneway Repeated measures ANOVA F-test	**MD = 7.23 F=20.95 p=0.001*** (S)**		**MD=0.70 F=0.53 p=0.47 (NS)**			
Anxiety score	Pretest	26.71	8.09	26.08	7.59	0.63	t=0.56 P=0.57 DF=192 (NS)
	Post-test-I	23.81	7.73	25.98	8.43	-2.17	t=1.87 P=0.07 DF=192 (NS)
	Post-test-II	21.41	6.63	25.92	7.72	-4.51	**t=4.37P=0.001*** DF=192 (S)**
	Post-test-III	19.90	6.66	25.40	8.11	-5.50	**t=5.17 P=0.001*** DF=192 (S)**
	Oneway Repeated measures ANOVA F-test	**MD = 6.81 F=21.33 p=0.001*** (S)**		**MD=0.68 F=0.47 p=0.45 (NS)**			
Stress score	Pretest	26.88	9.23	26.19	9.16	0.69	t=0.56 P=0.57 DF=192 (NS)
	Post-test-I	24.47	7.25	26.42	9.01	-1.95	t=1.67 P=0.10 DF=192 (NS)
	Post-test-II	21.67	7.38	25.52	9.33	-3.85	**t=3.18 P=0.001*** DF=192 (S)**
	Post-test-III	20.35	7.10	25.54	9.04	-5.19	**t=4.45 P=0.001*** DF=192 (S)**
	Oneway Repeated measures ANOVA F-test	**MD = 6.53 F=19.79 p=0.001*** (S)**		**MD=0.65 F=1.68 p=0.18 (NS)**			
Resilience score	Pretest	3.02	.68	3.16	.76	-0.14	t=1.32 P=0.19 DF=192 (NS)
	Post-test-I	3.50	.76	3.20	.70	0.30	t**=2.81 P=0.01** DF=192 (S)**
	Post-test-II	3.80	.79	3.22	.76	0.58	**t=5.23 P=0.001*** DF=192 (S)**
	Post-test-III	4.00	.75	3.24	.81	0.76	**t=6.81 P=0.001*** DF=192 (S)**
	Oneway Repeated measures ANOVA F-test	**MD = 0.98 F=28.71 p=0.001*** (S)**		**MD=0.08 F=1.05 p=0.30 (NS)**			

MD = Mean Difference, SD = Standard Deviation
P>0.05 is not significant, NS = Not significant, S= significant

Interpretation - The above table describes the mean scores of the Psychological variables (Depression, Anxiety, Stress and Resilience) and the testing of hypothesis using student independent t test. It demonstrates that all Psychological variables in the study group accept the research hypothesis, indicating that there is a significant difference in Depression (t=5.05, P=0.001), Anxiety (t=5.17 P=0.001), Stress (t=4.45 P=0.001)

and Resilience (t=6.81 P=0.001) between the study and control groups. It proves the effectiveness of the SMART training.

In experimental group, Repeated measures F-test analysis shows that, mean overall Psychological variables score is statistically significant different between pre-test and post-test-III of Depression (F=20.95, p=0.001***), Anxiety (F=21.33, p=0.001***), Stress (F=19.79, p=0.001***) and Resilience F=28.71, p=0.001***). Similarly, in control group, Repeated measures F-test analysis shows that, no statistically significant difference between pre-test and post-test-III of Depression (F=0.53, p=0.47), Anxiety (F=0.47, p=0.45), Stress (F=1.68, p=0.18) and Resilience (F=1.05, p=0.30). Therefore, we can conclude that Stress Management and Resilience Training (SMART) significantly reduces depression, anxiety and stress and improves resilience score among hemodialysis patients.

The below mentioned Line Graphs (Fig 4.4 – Fig 4.7) describes the mean score of the Psychological variables between study and control group in Pretest, Post test I, II & III

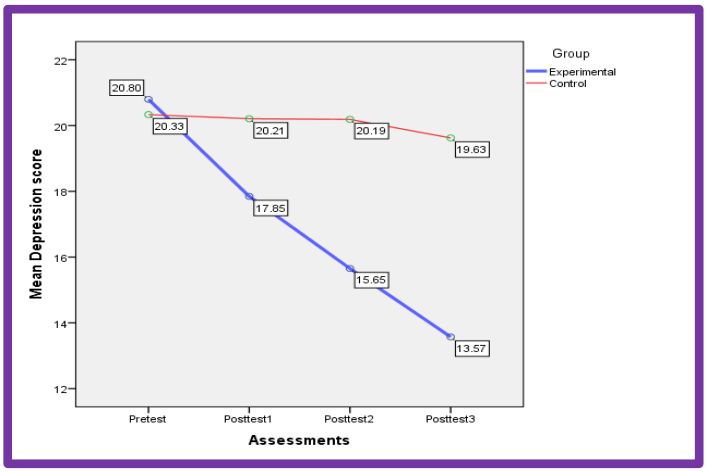

Fig 4.4 Comparison of mean Depression reduction scores between the experimental and control group in Pretest, Posttest I, II, III

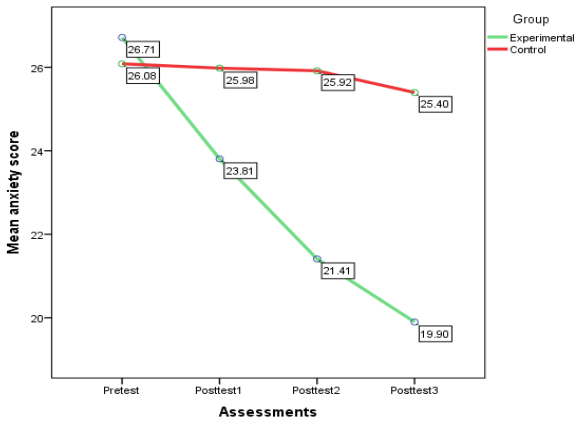

Fig 4.5 Comparison of mean Anxiety reduction scores between the experimental and control group in Pretest, Posttest I, II, III

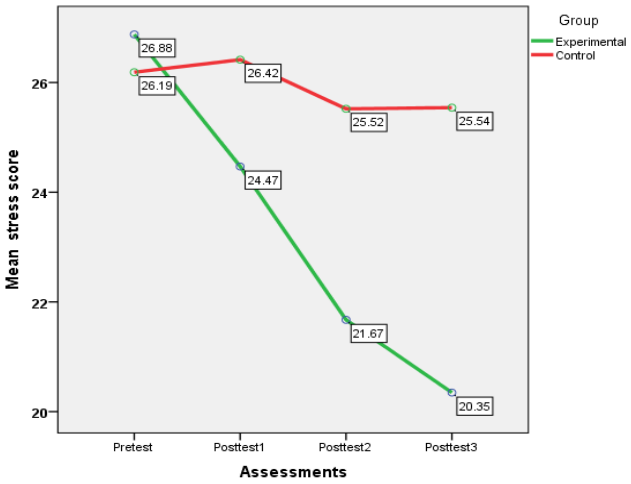

Fig 4.6 Comparison of mean Stress reduction scores between the experimental and control group in Pretest, Posttest I, II, III

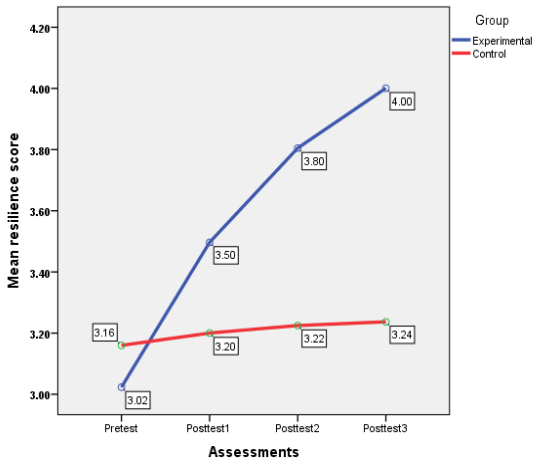

Fig 4.7 Comparison of mean Resilience Gain scores between the experimental and control group in Pretest, Posttest I, II, III

Section 5 - Correlation between the levels of depression, anxiety and stress and resilience in post-test levels of experimental group.

Table 4.7: Correlation between mean Depression reduction score, Anxiety reduction score, stress reduction score with Resilience gain score among Experimental group in the Post-test

	Correlation between Psychological Variables	**Mean score Mean±SD**	**Karl pearson Correlation coefficient**	**Interpretation**
Experimental group	Resilience gain score Vs Depression reduction score	0.98±0.85 7.42±11.30	r=0.36, P=0.01**	Fair correlation
	Resilience gain score Vs Anxiety reduction score	0.98±0.85 19.63±1.50	r=0.36, P=0.01**	Fair correlation
	Resilience gain score Vs Stress reduction score	0.98±0.85 6.53±10.41	r=0.37, P=0.01**	Fair correlation
	Depression reduction score Vs Anxiety reduction score	7.42±11.30 6.82±8.07	r=0.32, P=0.01**	Fair correlation
	Depression reduction score Vs Stress reduction score	7.42±11.30 6.53±10.41	r=0.44, P=0.001***	Moderate correlation
	Anxiety reduction score Vs Stress reduction score	6.82±8.07 6.53±10.41	r=0.42, P=0.01***	Moderate correlation

Interpretation: There is a significant, positive, fair correlation between Resilience gain score and Depression, Anxiety and stress reduction scores. It means when Resilience gain score increases their Depression, Anxiety and stress reduction scores also increases fairly.

Section 6 – Association between the levels of fatigue, blood pressure, depression, anxiety, stress and resilience in experimental group with the selected demographic and clinical variables after SMART training.

- Age ($\chi 2=8.62$, p=0.05), Family type ($\chi 2=7.12$, p=0.05) and Diabetes ($\chi 2=4.24$, p=0.05) are associated with level of Fatigue.
- Gender ($\chi 2=3.98$, p=0.05), Occupation ($\chi 2=6.49$, p=0.05) and Hypertension ($\chi 2=14.03$, p=0.001) are associated with Systolic Blood Pressure.
- Age ($\chi 2=8.81$, p=0.05), Marital status ($\chi 2=7.26$, p=0.05) and Hypertension ($\chi 2=3.90$, p=0.05) are associated with Diastolic Blood Pressure.
- Family support ($\chi 2=4.13$, p=0.05), Financial sources for treatment ($\chi 2=8.23$, p=0.05) and COPD / Asthma ($\chi 2=7.50$, p=0.01) are associated with level of Stress.
- Education ($\chi 2=6.16$, p=0.05) and financial sources for treatment ($\chi 2=6.37$, p=0.05) are associated with level of Anxiety.
- Occupation ($\chi 2=7.85$, p=0.05), Monthly family income ($\chi 2=10.20$, p=0.05) and Family history of Hypertension ($\chi 2=5.69$, p=0.05) are associated with level of Depression.
- Age ($\chi 2=8.96$, p=0.05), Financial sources for treatment ($\chi 2=5.89$, p=0.05), Duration of chronic kidney disease ($\chi 2=9.30$, p=0.05) and Duration of treatment on Hemodialysis ($\chi 2=8.95$, p=0.05) are associated with level of Resilience.

CHAPTER 5

DISCUSSION

This chapter discusses the findings of the current study in comparison to similar studies that were conducted in accordance with the goals.

5.1: Objective 1: To assess the baseline levels of physiological and psychological parameters among patients undergoing hemodialysis.

The present study findings revealed that majority of the patients 36% in study and 38% in control group are between 60-70 years of age, Majority 71% are males and 29% are females in both study & control group. In relation to Co-morbidities 43% in study group and 42% in control group had diabetes, 66% in the study and control group had Hypertension respectively. About 70% in study group and 65% in the control group had moderate level of Anemia. Physiologic parameters such as Systolic Blood pressure revealed that majority 29.59% in the study group and 32.29% in the control group had Grade 1 Hypertension. With regard to diastolic blood pressure about 47.96% in the study group and 55.21% in the control group had normal diastolic blood pressure. Level of fatigue was reported to be 58.16% in the study group and 67.71% in the control group. Psychologic parameters: About 24.49% in the study group and 27.08% in the control group had moderate level of Depression, about 25.51% had severe level of anxiety in the study group and 27.08% had moderate level of anxiety in the control group, about 23.47% had moderate level of stress in the study group and 20.83% had severe level of stress in the control group and majority 47.96% in the study group 43.75% in the control group had low level of resilience.

Anand, et.al (2010) found that people over 65 years of age account for almost half of dialysis-related incidents.(24) This indicates a significant proportion of the hemodialysis population is elderly, reflecting the higher burden of ESRD in this age group. **Bansal N, et al. (2023)** reported that in more than 80% of patients receiving maintenance hemodialysis have hypertension—a primary and controllable risk factor for cardiovascular disease.(14,25) According to **Gregg et al (2021**) in CKD patients receiving hemodialysis, fatigue is prevalent at about 70%, with up to 25% experiencing severe symptoms.(26)

Hanan Mosleh, et.al (2020) conducted a cross-sectional study among 122 patients with CKD and on hemodialysis and found 24.6% had depression and 19.7% had anxiety symptoms.(27) **Joseph et al. (2017)** discovered that 56% had severe stress, 27% had intense stress, 14% had moderate stress, and 3% had mild stress among hemodialysis patients in Kerala, India.(28) **Ebrahimi et al (2021)** graded the level of resilience as low, medium and high and found to be 4.6%, 73.1% and 22.3% respectively among hemodialysis patients with a mean overall resilience score of 86.63±19.48, and was at a medium level.(29)

5.2 Objective 2: To evaluate the effectiveness of Stress Management and Resilience Training on Physiological and Psychological parameters between experimental and control group.

In relation to physiological variables the present study findings showed that in the study group the percentage of Systolic Blood Pressure score reduction from the baseline score is 6.34%, whereas in the control group it is 0.64% and Diastolic blood pressure reduced from 7.43% from baseline score in the study group and 1.09% in the control group. Level of fatigue dropped from 29.17% from baseline score in the study group, whereas in the control group it is 0.83%. With regard to Psychological variables, level of stress reduced from 24.29% from baseline score in the study group, whereas in the control group it is only 2.48%. Level of Anxiety decreased from baseline score to 25.50% in study group and 2.61% in the control group. Level of Depression decreased from baseline score to 34.76% in study group and 3.44% in control group. Level of Resilience improved from baseline score to 19.60% in study group and 1.60% in control group among hemodialysis patients.

Ghasemi Bahraseman, et.al (2021) conducted a randomised controlled clinical trial using the block randomization among 65 hemodialysis patients from December 2019 to January 2020. Eight one-and-a-half-hour sessions of stress management training are conducted twice a week for the intervention group. The study found that the intervention group's stress coping methods and self-efficacy were higher than the control group's in every parameter ($P < 0.001$).(11) **Mehdi Amirkhani, et.al (2021)** conducted a Randomized Controlled Clinical Trial among 57 hemodialysis patients from October to December 2019 in Fasa city hemodialysis centers. Resilience building strategies were taught to intervention group as 12 sessions of 90 minutes training whereas control group received only routine care. Hemodialysis patients' quality of life was enhanced ($P<0.001$) and stress ($P<0.001$) and anxiety ($P<0.001$) were decreased through resilience training. The study recommends the use of resilience interventions as non – invasive, non- pharmacological and low cost technique can be implemented along with conventional treatment. (30)

5.3 Objective 3: To find out the correlation between the pretest and post-test levels of depression, anxiety and stress with resilience after stress management and resilience training in experimental group.

There is a significant, positive and fair correlation exists between Resilience gain score and stress, anxiety and depression reduction scores. ($r=0.37$, $r=0.36$, $p=0.36$ at $P<0.01$). When resilience gain score increases their stress, anxiety and depression reduction score also increases.

According to **Wong Lei Zher and Rafidah Bahari (2022)** found hemodialysis patients' resilience is inversely correlated with depression ($r=-0.59$), anxiety ($r=-0.44$), and stress ($r=-0.56$) moderately. Additionally, the study found that resilience and treatment adherence behaviour ($r=0.20$) were positively connected.(31) **Gülseren Keskin (2022)** also reported that when resilience decreases the risk of depression and anxiety increases.(32)

5.4 Objective 4: To associate the post-test levels of fatigue, blood pressure, depression, anxiety, stress and resilience in experimental group with the selected demographic and clinical variables.

The current study revealed that level of fatigue was associated with Age, type of family, and Diabetes. Systolic Blood Pressure was associated with Gender, Occupation and Hypertension while Diastolic blood pressure was associated with Age, Marital status and Hypertension. Stress was associated with Family support, financial source for treatment and COPD/Asthma while Anxiety was associated with Education and financial source for treatment. Depression was associated with Occupation, Monthly family income and family history of Hypertension. Resilience was associated with Age, financial sources for treatment and duration of CKD.

Stavros Tsirigotis, et.al (2022) found that advanced age, comorbidities, marital status, education level and insomnia were associated with physical and mental fatigue in hemodialysis patients at P<0.001).(33)

Priyadharshini, et.al (2023) reported that married status (x2=21.482, p=0.044) and occupation (x2=28.975, p=0.024) had significant association with the degree of anxiety and depression. Number of days per week (x2=20.637, p=0.008) and number of years received hemodialysis (x2=22.358, p=0.034), access for hemodialysis (x2=13.211, p=0.010) and the family history of renal problems (x2=11.405, p=0.022) had statistically significant association with the degree of stress and depression at the p<0.05 level.(34)

CHAPTER 6

SUMMARY, CONCLUSION, RECOMMENDATIONS & LIMITATIONS

6.1 SUMMARY

The study highlights the following findings among maintenance hemodialysis patients.

- Related to Age: Majority 36% in the study group and 38% in the control group were aged between 61-70 years. It proved that majority of hemodialysis patients are aged above 60 years.
- Majority are males: 71% are males and 29% are females in both the groups respectively.
- About 45% in the study group and 37% in the control group had CKD for less than a year and 62% in the study group and 50% in the control group were on Hemodialysis for less than a year.
- 54% in the study group and 62% in the control group had undergoing hemodialysis thrice in a week and 84% in the study group and 79% in the control group had Arterio-venous fistula
- With regard to history of Co-Morbidities: About 43% in the study group and 42% in the control group had Diabetes, 66% in both the groups had hypertension, 13% in the study group and 11% in the control group had Coronary Artery disease.
- About 70% in the study group and 65% in the control group had moderate level of Anemia.
- In relation to Physiological variables: Blood Pressure: Majority 29.59% in the study group and 32.29% in the control group had Grade 1 Systolic Hypertension. Majority 47.96% in the study group and

55.21% in the control group had normal Diastolic blood pressure. In relation to fatigue approximately 58.16 in the study group and 67.71% in the control group had fatigue.

- With regard to Psychological variables: About 24.49% in the study group and 27.08% in the control group had moderate level of Depression, 25.51% in the study group had severe anxiety and 27.08% in the control group had moderate level of anxiety, 23.47% in the study group moderate level of stress and 20.83% in the control group had severe level of stress, majority 47.96% in the study group and 43.75% in the control group had low level of Resilience respectively.
- The study found that the stress management and resilience training is effective in reducing Physiological parameters with the F value 16.94 for systolic BP, 18.97 for diastolic BP, 28.67 for level of fatigue, with highly significant at $p<0.001$, the study group's hypothesis is rejected. Whereas in the control group, no statistical significance was found.
- The study found that the stress management and resilience training is effective in reducing Psychological parameters with the F value 20.95 for level of depression, 21.33 for level of anxiety, 19.79 for level of stress and 28.71 for level of resilience, with highly significant at $p<0.001$, the study group's hypothesis is rejected. Whereas in the control group, no statistical significance was found.
- There is a significant, positive, fair correlation between Resilience gain score and Depression ($r=0.36$, $P=0.01$), Anxiety (0.36, $P=0.01$) and stress ($r=0.37$, $P=0.01$) reduction scores. It means Resilience gain score increases their Depression, Anxiety and stress reduction scores also increases fairly.

6.2 STRENGTHS OF THE STUDY

- One of the study's merits was the selection of samples that were representative of all hemodialysis patients, guaranteeing that the findings would have a wide range of applications.
- The feasibility and success of the study were also greatly aided by the favourable environment, the patient's willingness to engage in the interventional programs, and their adherence during the training period.
- Study was a Multicentric study. A well-planned intervention for 3 months delivered based on robust review of literature.
- Researcher could manage to follow up the required participants till the final post-test meeting the attrition.

6.3 LIMITATIONS OF THE STUDY

- Physiological parameters like fatigue and psychological parameters like stress, anxiety, depression and resilience were assessed in the study was based on the subjective data of the participants although it is assessed by standardized scales.
- There was a need to adjust the timings of follow up accordingly to meet the participants availability.
- As Hemodialysis patients are more vulnerable population Randomization was not possible.

6.4 RECOMMENDATIONS OF THE STUDY

- The health care centers can take initiative in adopting stress management and resilience training in their centers to improve the physical and mental health of the hemodialysis patients.
- Nurses can adopt SMART training as part of their routine care as complementary therapy.
- The study can be done among different samples to enhance its effectiveness among different kinds of the patients with chronic illness.
- Large sample size using different study designs in various regions of the country can be done.
- The institutions can initiate and develop a value-added course or certification program for students to improve their understanding of SMART program.

6.5 IMPLICATIONS OF THE STUDY

Nursing Administration -The concept of SMART can be promoted and recommended to the policy makers in Academic institutions or universities to include into the curriculum for the benefit of the student nurses and the patients

Nursing Education - Nurse's knowledge and skill to be upgraded by giving proper training

Nursing Service - SMART can be adopted in the hospital and community setup to improve the welfare of the hemodialysis patients.

Nursing Research - Similar such studies can be done among different population in different settings with different ailments.

6.6 CONCLUSION

Stress Management and Resiliency Training (SMART) helps the Hemodialysis patients to learn self-care techniques that found to be more effective in reducing the fatigue, blood pressure, depression, anxiety, stress and improves the resilience levels. The substantiality is ensured by the feedback and satisfaction level of the participants. It is also substantiated by the statistical analysis of the physiological and psychological parameters before and after the intervention as discussed earlier. Hemodialysis patients are in dire need of stress management and resilience training, and this non-pharmacological complementary therapy is more affordable and can be incorporated into routine care by nurses and other medical professionals to help promote the hemodialysis patients' physical and mental health.

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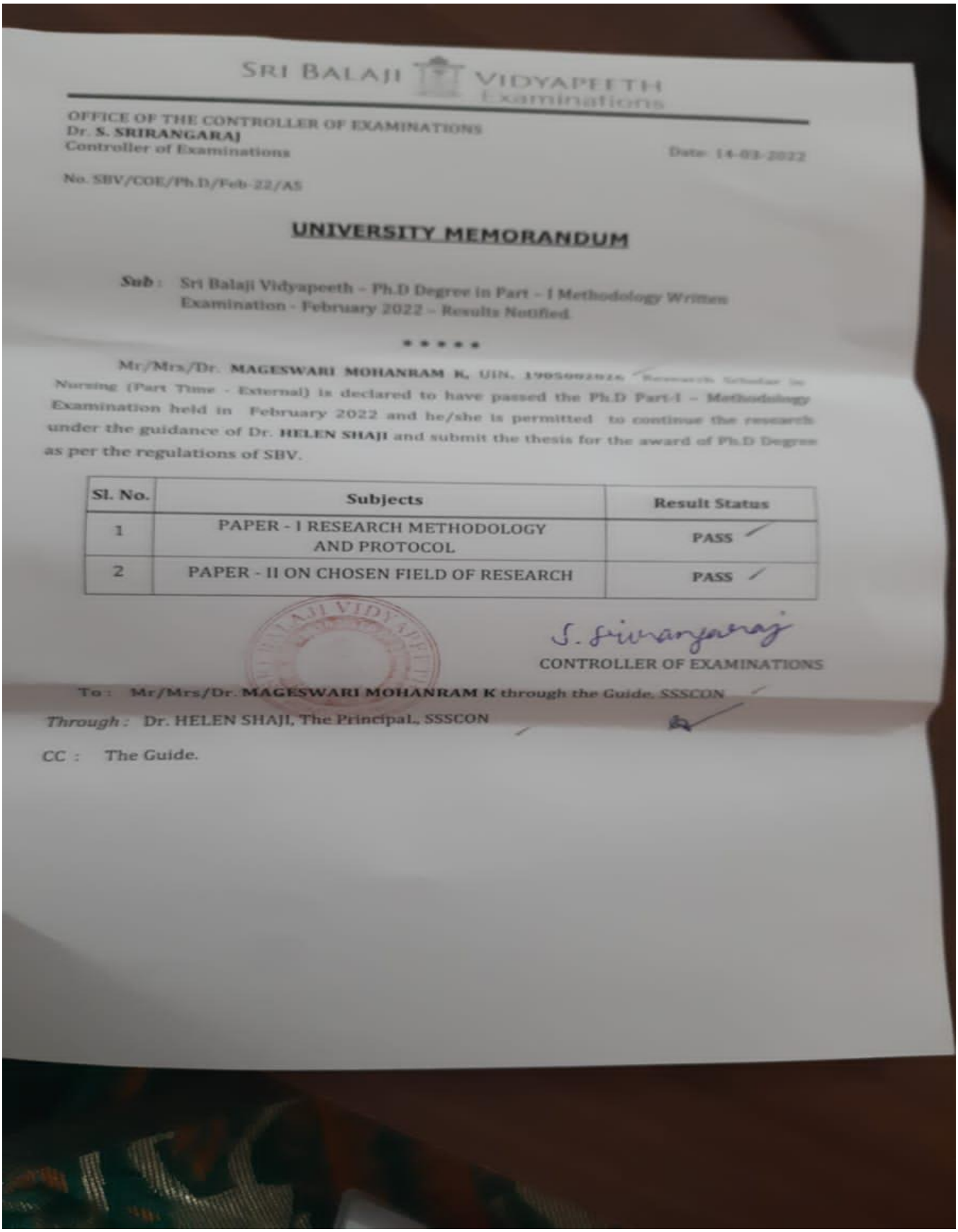
ANNEXURES

RESEARCH METHODOLOGY EXAM PASS CERTIFICATE



SRI BALAJI VIDYAPEETH
Examinations

OFFICE OF THE CONTROLLER OF EXAMINATIONS
Dr. S. SRIRANGARAJ
Controller of Examinations

Date: 14-03-2022

No. SBV/COE/Ph.D/Feb-22/A5

UNIVERSITY MEMORANDUM

Sub : Sri Balaji Vidyapeeth – Ph.D Degree in Part – I Methodology Written Examination - February 2022 – Results Notified.

* * * * *

Mr./Mrs./Dr. **MAGESWARI MOHANRAM K**, UIN. 190509202[illegible], Research Scholar in Nursing (Part Time - External) is declared to have passed the Ph.D Part-I – Methodology Examination held in February 2022 and he/she is permitted to continue the research under the guidance of Dr. **HELEN SHAJI** and submit the thesis for the award of Ph.D Degree as per the regulations of SBV.

Sl. No.	Subjects	Result Status
1	PAPER - I RESEARCH METHODOLOGY AND PROTOCOL	PASS
2	PAPER - II ON CHOSEN FIELD OF RESEARCH	PASS

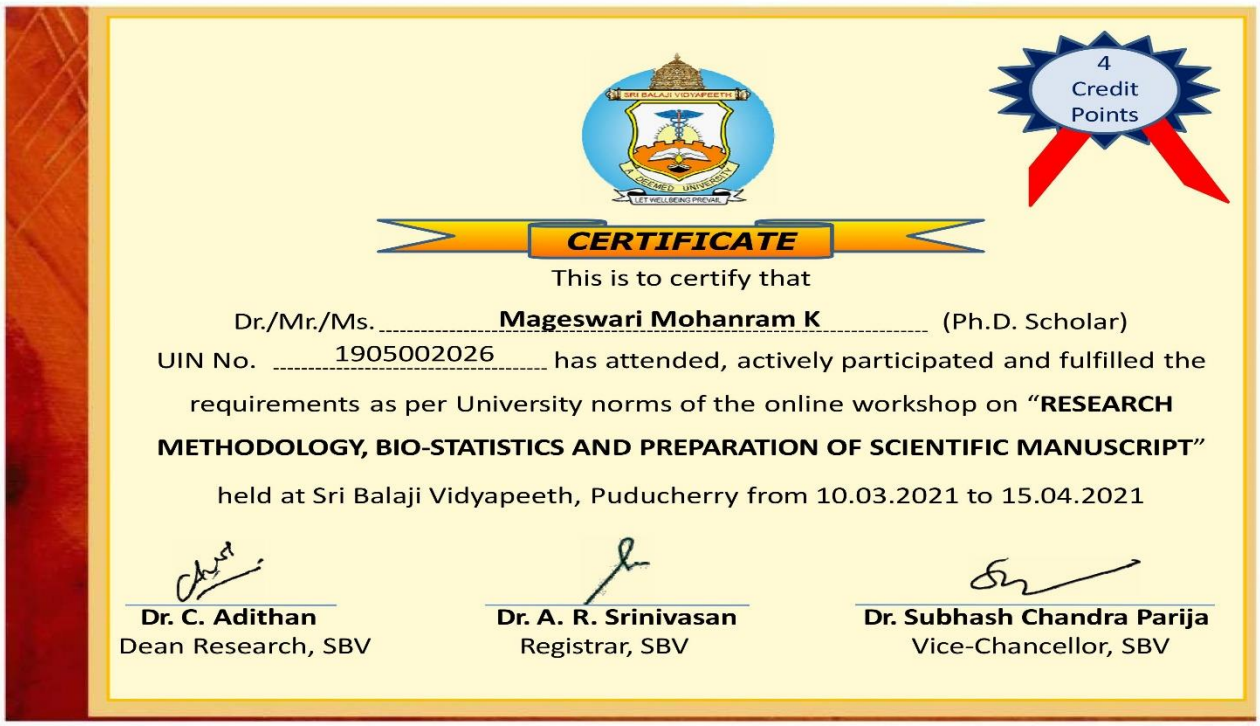
S. Sriranjaraj
CONTROLLER OF EXAMINATIONS

To : Mr/Mrs/Dr. **MAGESWARI MOHANRAM K** through the Guide, SSSCON

Through : Dr. HELEN SHAJI, The Principal, SSSCON

CC : The Guide.

RESEARCH METHODOLOGY COURSE CERTIFICATES CONDUCTED BY SBV



4 Credit Points

CERTIFICATE

This is to certify that

Dr./Mr./Ms. **Mageswari Mohanram K** (Ph.D. Scholar)

UIN No. 1905002026 has attended, actively participated and fulfilled the requirements as per University norms of the online workshop on "**RESEARCH METHODOLOGY, BIO-STATISTICS AND PREPARATION OF SCIENTIFIC MANUSCRIPT**" held at Sri Balaji Vidyapeeth, Puducherry from 10.03.2021 to 15.04.2021

Dr. C. Adithan	Dr. A. R. Srinivasan	Dr. Subhash Chandra Parija
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This is to certify that Dr./Mr./Ms **MAGESWARI K**

UIN No. **1905002026** *has attended, actively participated in " UGC Mandate RESEARCH AND PUBLICATION ETHICS COURSE " held at Sri Balaji Vidyapeeth, Puducherry from 16.06.2021 to 21.07.2021. He /she has fulfilled the requirements as per University norms of the online course and secured* **A+** *Grade and 2 credit points.*

Dr. N.Vezhavendhan	Dr. C.Adithan	Dr. A.R.Srinivasan	Dr. Subash Chandra Parija
Program coordinator	Dean Research, SBV	Registrar, SBV	Vice-Chancellor, SBV

INSTITUTIONAL ETHICS COMMITTEE

Dr.KAMAKSHI MEMORIAL HOSPITAL PVT. LTD.

IEC Clearance Number: 07/IEC/2021 Date: 27.05.2021

INSTITUTIONAL ETHICS COMMITTEE – CLINICAL STUDIES CERTIFICATE

Mrs. K. Mageswari, M.Sc (Nursing), studying Ph.D Nursing under Sri Balaji Vidyapeeth University, Puducherry (Reg. No.1905002026) has applied to the Institutional Ethics Committee – clinical studies to review the proposed thesis work on the topic **"Effect Of Stress Management and Resilience Training (SMART) on Physiological and Psychological Parameters Among Patients Undergoing Hemodialysis at Selected Hospitals – An Interventional Study".** This work was done under the guidance of Chief Guide Dr. Helen Shaji J.C Ph.D (N) Principal cum Professor at Shri Sathya Sai College of Nursing, Sri Sathya Sai Medical College & Research Institute, Chengalpet District.

The proposal has been reviewed and approved during the Institutional Ethics Committee – clinical studies meeting held on 24th March 2021.

S.No.	Name	M/F	Qualification	Designation	Affiliated Y/N	Position in the Committee
1.	Dr. RejivRajendranath	M	MBBS, MD, DM, DNB – Medical Oncology	Consultant	No	Chairperson
2.	Dr.Seetharaman V	M	MBBS, DA – Anaesthesia	Consultant	Yes	Member Secretary
3.	Dr.C. V Pillai	M	MBBS, MD – General Medicine	Consultant	Yes	Clinician
4.	Dr.Sudhakaran C	M	MBBS, MD – Pharmacology	HOD	No	Basic Medical Scientist
5.	Dr.KalaKandhasamy	F	MBBS, MD – Pathology & Microbiology	Consultant	Yes	Basic Medical Scientist
6.	Dr.RamyaRamanathan	F	MBBS, DNB – Family Medicine	Consultant	Yes	Clinician

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7.	Mr.Mukunth S	M	LLB, LL.M (Master of Laws)	Legal Expert	No	Lawyer
8.	Mr.John Maria Joseph D.L	M	BSW, MSW	Social Worker	No	Social Scientist
9.	Mr.Balaji R	M	B. Com, FCA	Consultant – Auditor	No	Layperson
10.	Mr.Murugan C	M	MSW, M.Phil.	Social Worker	Yes	Social Scientist

The Institutional Ethics Committee – clinical studies have reviewed the proposal, its methodology and design of the study. The proposed thesis work can be started in the presented form without any modifications.

The Institutional Ethics Committee – clinical studies approval is only to meet their academic requirement and will not amount to any approval of the conclusion / recommendations as conclusive, deserving adoption and implementations, in any form, in any health care institution.

The institutional ethics committee- clinical studies is constituted and works as per ICH-GCP, ICMR and revised schedule Y guidelines.

Regards,

Dr. Seetharaman V
Member Secretary,
Institutional Ethics Committee – Clinical Studies
Dr. Kamakshi Memorial Hospital, Chennai – 100

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1. **User information**

User name	Mageswari K
Category of User	Individual Practice or Academic
User address	No. 36/1, II Floor, Angalamman Kovil Street, Kottur, Chennai -85 Apartment Chennai 600085 Tamil Nadu India
User VAT number	
User email	magisharanvel@gmail.com
User phone	09940280441
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Effective Date	Date of acceptance of these Special Terms by the User
Expiration Date ("Term")	Upon completion of the Stated Purpose
Name of User's contact in charge of the request	Mageswari K

3. **Identification of the COA**

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Name of the COA	MAF - Multidimensional Assessment of Fatigue
Author	Belza Basia L
Copyright Holder	Belza Basia
Copyright notice	MAF © Basia Belza, 1993. All Rights Reserved.
Bibliographic reference	Belza B, Miyawaki CE, Liu M, Aree-Ue S, Fessel M, Minott KR, Zhang X. A Systematic Review of Studies Using the Multidimensional Assessment of Fatigue Scale. J Nurs Meas. 2018 Apr 1;26(1):36-75 (PubMed abstract) Belza B. Comparison of self-reported fatigue in rheumatoid arthritis and controls. Journal of Rheumatology. 1994;22:639-643 Belza BL, Henke CJ, Yelin EH, Epstein WV, Gilliss CL. Correlates of fatigue in older adults with rheumatoid arthritis. Nurs Res. 1993 Mar-Apr;42(2):93-9 (PubMed abstract)
Modules/versions needed	MAF

4. **Context of use of the COA**

The User undertakes to use the COA solely in the context of the Stated Purpose as defined hereafter.

4.1 Stated Purpose

Other project

Title	Effect of Stress Management and Resilience Training (SMART) on Physiological and Psychological Parameters among patients undergoing Hemodialysis at Selected hospitals – An Interventional study
Disease or condition	Chronic renal failure
Planned Term*	Start: Jan/ 2022; End: Dec/2023

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Description (including format or media)	AIM The present study aims to assess the effect of stress management and resilience training (SMART) on the levels of blood pressure, fatigue, depression, anxiety, stress and resilience among patients undergoing hemodialysis. This training helps to enhance the resilience of the patients undergoing hemodialysis to cope with these stressors.OBJECTIVES1)To assess the baseline levels of blood pressure, fatigue, depression, anxiety, stress, resilience among patients undergoing hemodialysis.2)To evaluate the effectiveness of Stress Management and Resilience Training on Physiological and Psychological parameters.3)To correlate the relationship between the levels of depression, anxiety and stress with resilience in pretest and posttest of experimental group.NULL HYPOTHESIS•H1 - There is no significant difference between the pretest and posttest levels of blood pressure, fatigue, depression, anxiety, stress and resilience among patients undergoing hemodialysis in the experimental group.•H2 - There is no significant difference in the posttest levels of blood pressure, fatigue, depression, anxiety, stress and resilience among patients undergoing hemodialysis between experimental and control group.•H3 - There is no significant association between the levels of blood pressure, fatigue, depression, anxiety, stress and resilience with their selected demographic variables in experimental group after Stress Management and Resilience Training among patients undergoing hemodialysis.

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Certificate

This is to certify that

Prof. K. MAGESWARI

has attended

Three Months Certification Course

on

Stress Management and Resilience

from Nov' 2021 to Jan' 2022

She has attended all the classes and successfully completed the examination held on 3rd Feb 2022.

Dr. T. Santhanam, Ph.D
Director

Copy of Podium / Poster presentations

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Mrs.A.Manjula
Organizing Secretary
Lecturer, Dept. of Medical Surgical Nursing,
SRFON, SRIHER (DU)

Dr. S. J. Nalini
Conference chairperson
Professor & Principal
SRFON, SRIHER(DU)

Dr.Mahesh Vakamudi
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This is to certify that **Mageswari .K** of Dr.Kamakshi Memorial Hospital presented his/her worthy Poster presentation titled *Cryotheraphy Reduces Arteriovenous Fistula Puncture Pain Among Clients Undergoing Hemodialysis A Pre-Experimental Study* in the "2nd International Conference on Nursing Science and Healthcare (ICNSH-2021)" organized by Society For Nursing Practice (SFNP) & BioLeagues Worldwide and Co-organized by SRM College of Nursing on 21st & 22nd May 2021.

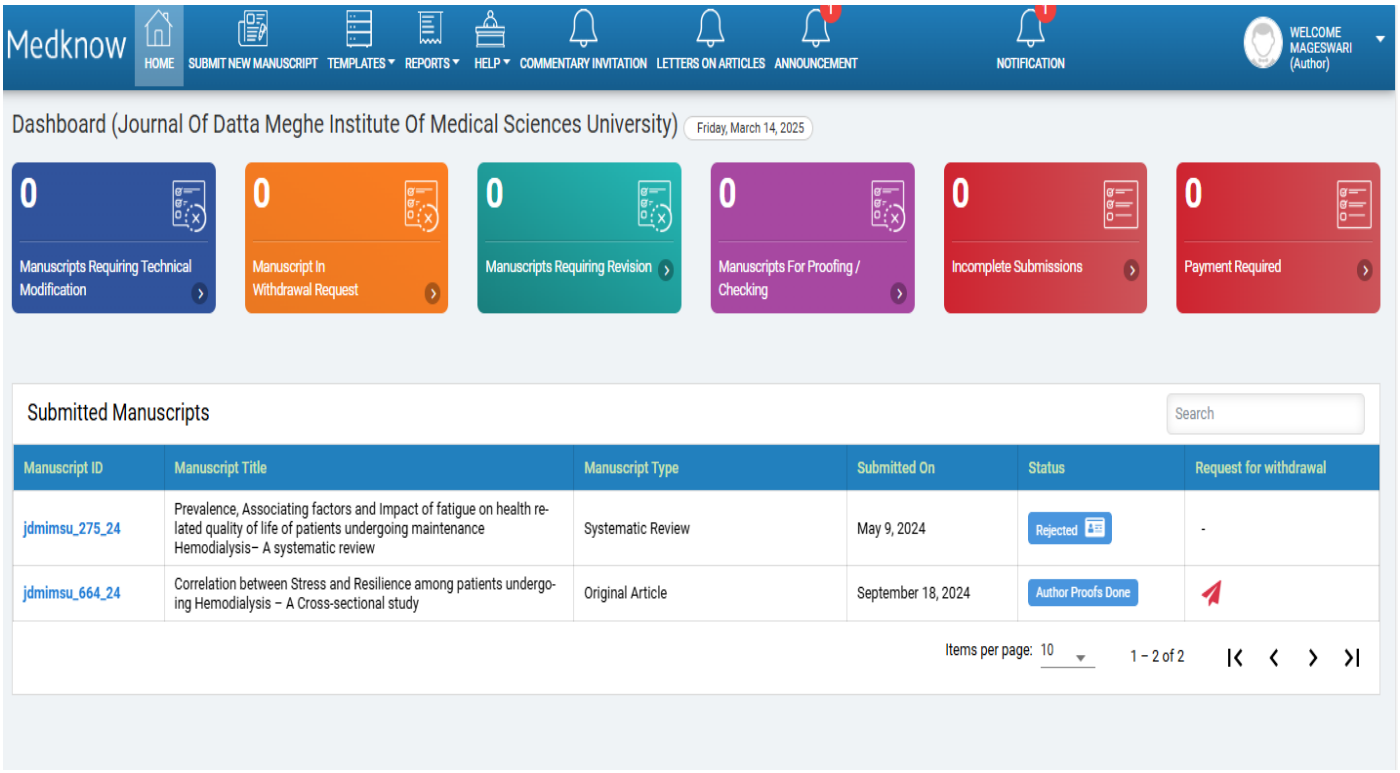
Dr. C. Kanniammal, M.Sc(N), Ph.D.,
Dean - SRM College of Nursing
Tamil Nadu, India

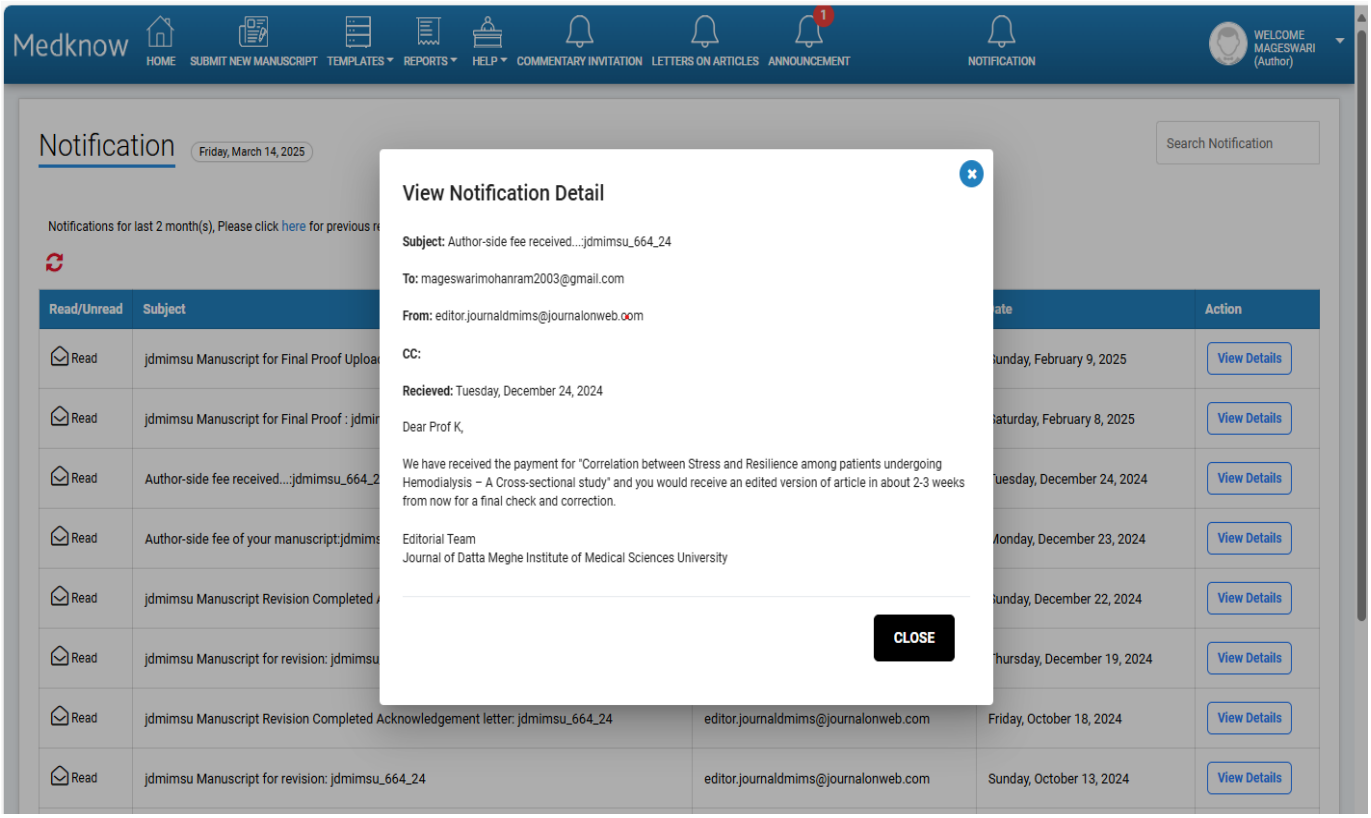
Mr. Rudra Bhanu Satpathy
CEO & Founder
BioLeagues Worldwide

SCOPUS PUBLICATIONS

Manuscript 1: Correlation between Stress and Resilience among patients undergoing Hemodialysis – A Cross-sectional study.

This manuscript was accepted to publish in the Journal of Datta Meghe Institute of Medical Sciences University, SCOPUS indexed. Article No: jdmimsu_664_24 Correlation between Stress and Resilience among patients undergoing Hemodialysis – A Cross-sectional study. Review, Payment, and Author proofing done and yet to publish. The acceptance, payment details, Indexing and Abstract were attached.





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Original Article

Correlation Between Stress and Resilience among Patients Undergoing Hemodialysis – A Cross-sectional Study

K. Mageswari Mohanram[1,2], J. C. Helen Shaji[1,3]

[1]???, Sri Balaji Vidyapeeth (Deemed to be University), Puducherry, [3]???, SRM College of Nursing, Faculty of Medical and Health Sciences, SRMIST, Chengalpattu, Tamil Nadu, India, [2]Dr. Kamakshi College of Nursing

Abstract

Introduction: Long-term hemodialysis is used to treat end-stage renal disease (ESRD), a chronic and progressive illness. Many individuals experienced numerous medical and psychological problems while receiving treatment. High levels of stress have been found to be detrimental to mental health, resilience and quality of life. Thus, the aim of the current study was to assess the relationship between stress and resilience in Hemodialysis dependent end-stage renal failure patients. **Methods:** Descriptive correlational cross-sectional design was used and 78 hemodialysis patients were selected by purposive sampling method. The level of stress and resilience were assessed using stress component of Depression Anxiety Stress Scales – 21 rating scale and brief resilience scale. The statistical tests of mean, standard deviation, and Pearson Rank correlation coefficient were applied to the data analysis. **Results:** The study results revealed that the levels of stress to be categorized as normal – 48 (61.5%), mild – 14 (17.9%), moderate – 9 (11.5%), severe – 3 (3.9%), and extremely severe – 4 (5.2%), respectively, with the mean stress score of 13.41 ± 9. According to resilience 32.1% had low, 48.7% had normal, and 19.2% had high level of resilience with the mean value of 3.5 ± 0.8. Pearson rank correlation coefficient test $r = -0.37$ stated that moderate negative correlation exists between the level of stress and resilience, which is highly significant at $P < 0.01$. **Conclusion:** The results of the study revealed that hemodialysis patients' resilience is influenced by their level of stress. As stress increases resilience decreases vice versa. This study revealed that developing resilience is the vital need for hemodialysis patients to improve the good quality of life and healthy mental wellbeing.

Keywords: End-stage renal disease, hemodialysis, resilience, stress

Introduction

End-stage renal disease (ESRD) is a chronic, debilitating and life-threatening condition in which the patients either undergo renal replacement therapy lifelong or renal transplantation. It has been projected that there will be almost 30% more ESRD patients worldwide by 2050.[1] A recent study was estimated the age-adjusted incidence rate of ESRD in India was reported to be around 150 per million population and over 1 lakh new patients undergo renal replacement therapy annually.[2] Hemodialysis is the common renal replacement therapy which helps to extend the survival of patients. An estimated global number of persons receiving maintenance hemodialysis is more than 2 million.[3]

In addition to the issues with medical therapy, dialysis users often struggle with numerous psychological problems. Due to the aggravation of chronic renal failure and long-term nature of hemodialysis treatment often leads to significant stresses that has an impact on these patients' psychosocial functioning. As a result, many psychological issues such as stress, depression, anxiety, irritation, social deficits, and even suicidal ideation were observed among these patients.[4] These psychological complications may even affect their physical status and reduce their quality of life vice versa. As stress is perceived as a personal experience, there are differences in how people react to it.[5] Time restrictions, disease condition, need of long-time adjustment with hemodialysis, dependency, dread of dying, losing one's autonomy, changes in role perception,

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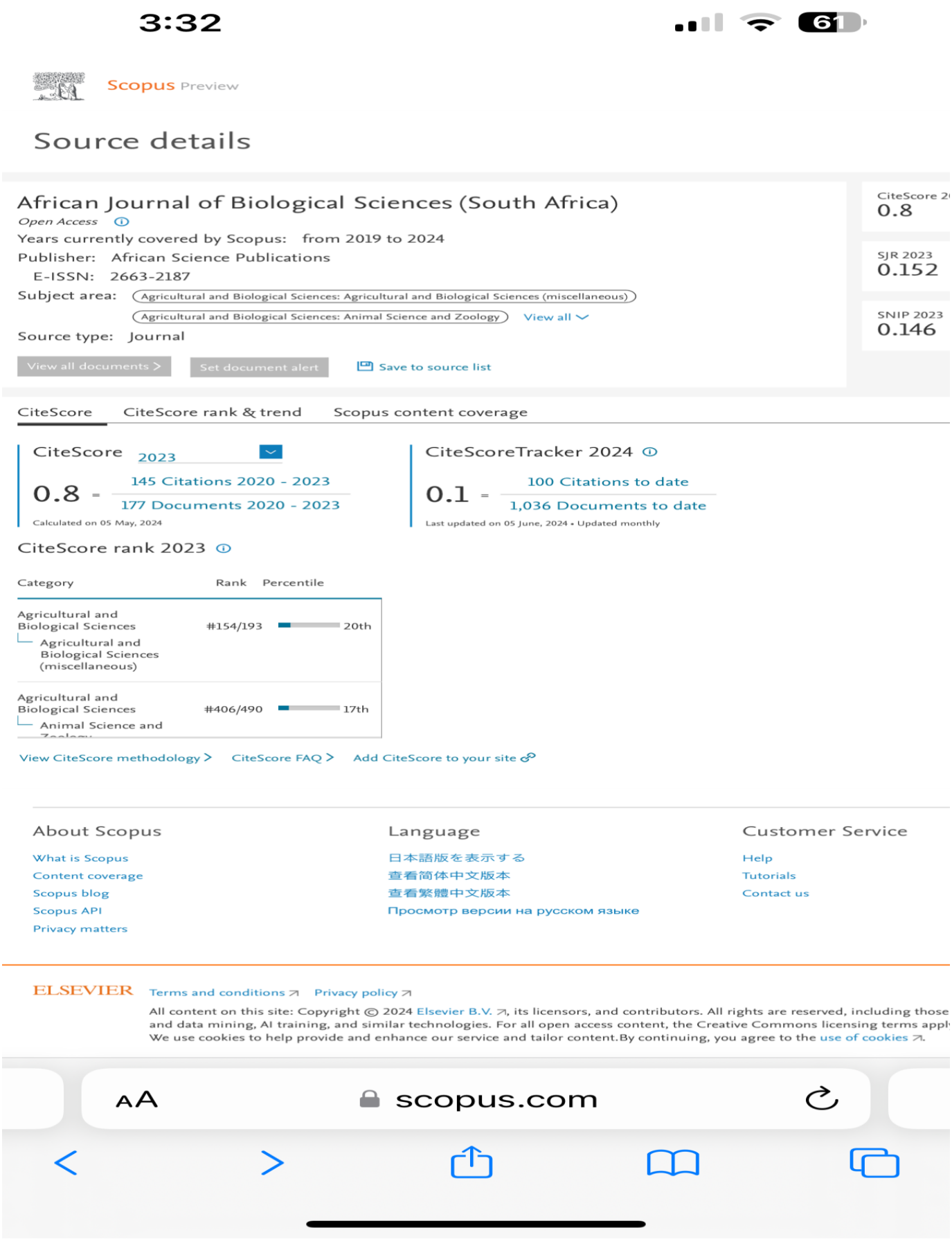
Manuscript 2: **Prevalence, Associating factors and Impact of fatigue-- A Systematic critical review on maintenance Hemodialysis patients** published in African journal of Biological sciences, SCOPUS indexed. Published article and indexing status attached.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Prevalence, Associating factors and Impact of fatigue-- A Systematic critical review on maintenance Hemodialysis patients

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Abstract

End stage renal disease patients need to undergo hemodialysis lifelong to prolong their survival. Fatigue is the commonest and multifactorial problem among patients on hemodialysis. There are many factors leading to physical and mental fatigue among patients on hemodialysis which has a detrimental effect on their day-to-day activities and health related quality of life. This critical review is aimed at exploring the prevalence, the associating factors, and the impact of fatigue on health-related quality of life of patients undergoing hemodialysis. Online databases such as PubMed index, Web of science, PsycINFO, CINAHL, Google Scholar, etc., were scrutinised to get the full text articles. The prevalence of fatigue is high among patients on hemodialysis and estimated to be between 41% to 83.8%. Existing studies have listed out the several factors associated with fatigue into different aspects such as Physiological factors, Psychological factors, Social factors, Dialysis/ Disease related factors, Changes in Biochemical Parameters. Ageing, comorbidities, feminine gender, poor sleep quality are the common associating factors of fatigue. Depression and anxiety are also more frequently associated with fatigue. High prevalence of fatigue impairs the daily activities of the patients and leading to decreased working capacity, restricted functioning, mood instability, sleep disturbances, impaired family and social functioning. These consequences decrease the health-related quality of life and increases the morbidity and mortality of the patients on hemodialysis. Therefore, this critical review helps to expand the knowledge of the health care professionals to assess, identify and intervene the fatigue as early as possible.

Keywords

Fatigue, Hemodialysis, End stage renal disease, Systematic Review

INTRODUCTION

End stage renal disease (ESRD) is a debilitating illness with a detoriating renal function. Hemodialysis is the main life supporting treatment option for ESRD patients. A report by Global Burden of Disease, Injuries and Risk Factors in 2017 estimated that approximately 3 million patients are treated by hemodialysis worldwide and this will increase to 5.4million by 2030**.** [1]

Patients undergoing maintenance hemodialysis often complain of many issues which affect their quality of life. Fatigue is one of the commonest and a chronic, burdensome, and a most dreaded symptom experienced by patients when undergoing maintenance hemodialysis.[2] 60 – 97 % of patients on hemodialysis reportedly have fatigue as a frequent, severe, distressing, and troublesome symptom. An online survey conducted during pandemic reveals the prevalence of fatigue was around 53.7% among patients on hemodialysis.[6] Old age and female patients were independently associated with a higher burden of fatigue when undergoing hemodialysis. There are multiple causes leading to fatigue like poor nutritional status, repeated and long-time exposure to hemodialysis, anemia, uremia, dialysis inadequacy, advancing age, sleep disorders, inflammation, pain in bones and muscles and comorbid diseases which also have an adverse impact on the quality of their life.[3,4] Fatigue leads to physical, emotional, and/or cognitive exhaustion and tiredness which is not relieved by rest particularly following haemodialysis**.**[5]

Fatigue patients frequently become tired, weak and have lack of energy to do the daily activities. Stress and frustration induced by lack of energy leads to declined cognitive function, ability to work and achieve personal goals. Chronic fatigue negatively affects the physical, cognitive, and social activities that leads to poor life satisfaction. Restless leg syndrome among renal insufficiency patients has highest levels of fatigue. [3]

A qualitative study revealed that the chronic experience of fatigue adversely affects not only the patient's daily basic activities but also participating in other social activities ultimately leading to social isolation and poor quality of life as a marked consequence. Approximately one in two patients reported fatigue clinically, which further increases the pervasiveness of symptoms of fatigue among maintenance hemodialysis patients. Functional impairment produced by fatigue among hemodialysis patients increases 3% risk of death.[5]

However, fatigue is mostly assessed by a subjective expression of the patients: It is often under-recognized and under-treated by healthcare providers and negatively affects the physical, cognitive, and social wellbeing of the patients undergoing hemodialysis thus ultimately affecting their quality of life and life satisfaction.[3] In a cross-sectional study it was reported that the presence of a number of comorbidities represented as one of the important cause of fatigue and acted as a barrier in maintaining the quality of life of hemodialysis patients.[3,4] Poor quality of life leads to the complications like depression and malnutrition and even increased mortality.[4] Patients are often found struggling to maintain the health related quality of life and fatigue is an important predictor of increased risk of death among patients on hemodialysis.[5] They often feel helpless in identifying and controlling the symptoms induced by fatigue. Mostly fatigue has been underrated and poorly studied among patients on hemodialysis and this knowledge gap decreases their capability in controlling their fatigue related symptoms. Hence this study is aimed at exploring the systematic review on prevalence, associating factors and impact of fatigue on health-related quality of life of patients undergoing maintenance hemodialysis.

METHODS

An online search done on fatigue and hemodialysis through various search engines like PubMed index, Web of science, PsycINFO, CINAHL, Google Scholar, etc., Abstract, and

full text articles have been browsed and scrutinised according to the objective of the review and included in the study. A narrative review approach has been followed for this systematic review.

The key terms used to search the databases online are the combination of words like “Fatigue”, “Hemodialysis” and “Quality of Life”. The search was limited to the original full text online articles published from 2015 to 2023 to allow for adequate appraisal of the findings. Inclusion criteria were: (1) Observational studies encompassing cohort, cross-sectional, analytical and correlational studies, (2) Participants aged 18 years or older with end stage renal disease and on maintenance hemodialysis, (3) The articles that had explicit findings related to prevalence, impact of fatigue and its associated factors among hemodialysis patients and (4) The articles published in English literature only. Exclusion criteria were: (1) The articles that discussed the factors affecting the quality of life other than fatigue, (2) The articles discussed only the fatigue among peritoneal dialysis patients and renal transplant patients, (3) To focus only on prevalence, associated factors, and impact of fatigue, coping strategies and interventional measures to curtail fatigue among hemodialysis patients related articles were excluded. The full text articles that fit the above criteria only were adopted to be included in the review. Out of total 1149 abstracts, 142 non duplicated abstracts were reviewed. 33 full text articles that fulfil the criteria of the study were completely scrutinised to incorporate into the study. Finally, 16 full text articles were selected according to the PRISMA guidelines and reviewed in this study.**(Fig: 1)** The extracted data includes the following items (Table 1): (1) First Author name and year of Publication, (2) Aim, (3) Design, (4) Population / Age Criteria, (5) Fatigue grading tool, (6) Inclusion and Exclusion criteria, (7) Prevalence of Fatigue, (8) Results found.

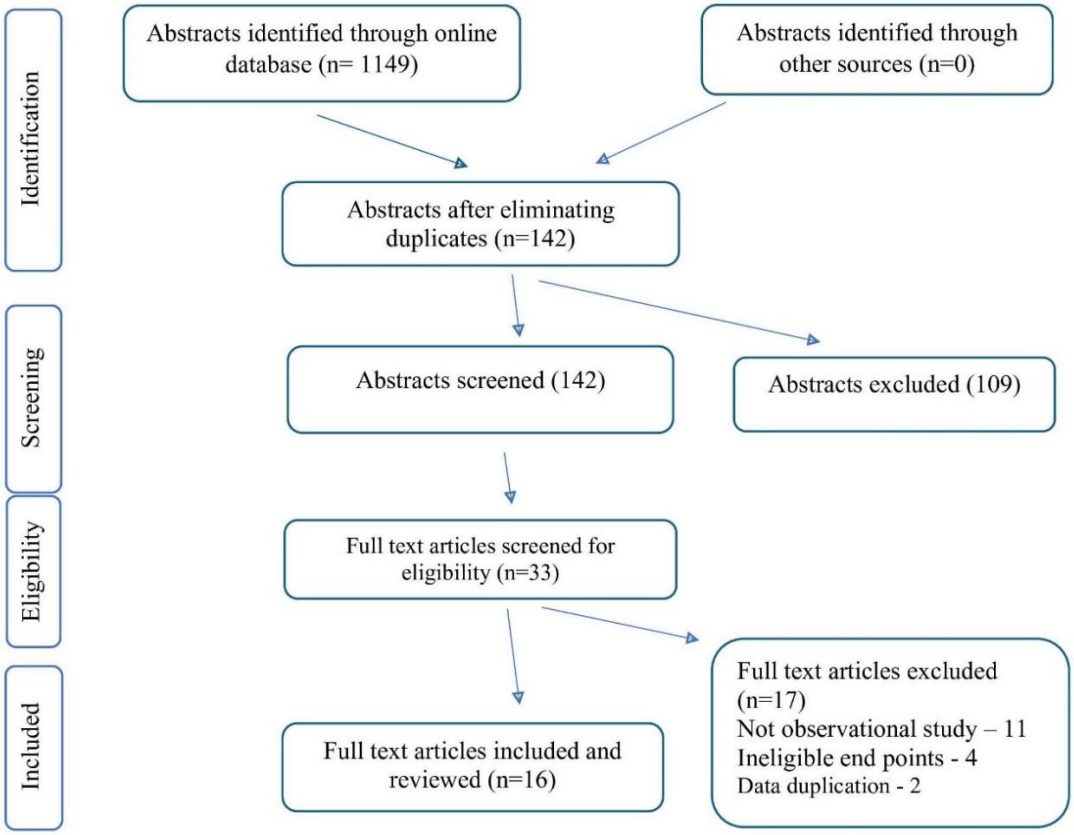
Identification
Screening
Eligibility
Included
Abstracts identified through online database (n= 1149)
Abstracts identified through other sources (n=0)
Abstracts after eliminating duplicates (n=142)
Abstracts screened (142)
Abstracts excluded (109)
Full text articles screened for eligibility (n=33)
Full text articles excluded (n=17)
Not observational study – 11
Ineligible end points - 4
Data duplication - 2
Full text articles included and reviewed (n=16)

Fig 1: PRISMA flow diagram of the different phases of the systematic review

Table 1: Prevalence, Associating factors and Impact of fatigue among patients on haemodialysis

FIRST AUTHOR AND YEAR OF PUBLICATION	AIM	DESIGN	POPULATION/ AGE CRITERIA	FATIGUE GRADING TOOL	INCLUSION /EXCLUSION CRITERIA	PREVALENCE OF FATIGUE	RESULTS FOUND
Ricardo Eugenio, et. al (2023)[7]	To assess the prevalence and the predisposing factors of fatigue.	Cross-sectional study/ Brazil	95/ 24 - 87 years	The Chalder Questionnaire.	Inclusion criteria -Stage 5 CKD and on HD Exclusion criteria: - Patients undergoing peritoneal dialysis. -Age < 21 years - Dialysis for < 12 months - Those with Psychiatric disorders, active infectious or autoimmune disease, liver failure, and	The prevalence of fatigue in patients undergoing haemodialysis was 51.6%	Fatigue was associated with depression 34.7% (65.9% vs. 34.1%, P = 0.001) and poor sleep quality 69.5% (59.1% vs. 49.9% P = 0.027) and it lowers the quality of life in terms of physical and general health than non-fatigue patients. 50% of patients have depression. Women have more frequent depression than men. 2% improvement in physical health and 3% improvement in general health will reduce the probability of fatigue.

					metastatic malignant neoplasms.		
Stavros Tsirigotis, et.al (2022)[3]	To identify the factors associated with fatigue	Cross-sectional study/ Greece	100/ 20 - 85 years	Modified Fatigue Impact Scale (MFIS)	Inclusion: - Aged 20 years or older - At least three months on haemodialysis. - Ability to speak, read, and write Greek Exclusion: -Insufficient language ability -Age above 85 years -Cognitive deterioration -Drug or alcohol abuse.	High level of Physical fatigue (p=0.001) was reported among haemodialysis patients aged over 70 years.	Patients with Ageing (73%), Co-morbidity (44%), sufficient anxiety about the dialysis regimen (66%), Insomnia (15%), Divorced/ Widowed patients, those with primary education, inadequate information about the disease, those perceived tired after dialysis, those perceived changes in their body image have high level of physical and mental fatigue that leads to poor quality of life.
Yu-Hui Wu, et. al (2022)[8]	To associate fatigue, anxiety and depression with physical activity among patients with and without comorbidities.	Cross-sectional survey design/ China	120/ 20 years to - no upper age limit	Brief Fatigue Inventory —Taiwan version (BFI-T)	Inclusion criteria: -Aged 20 years and older -At least 3 months on HD with three weekly sessions. -Had sufficient cognitive function and accepted to participate. -Able to read and communicate in Chinese. Exclusion criteria: -Patients with cognitive disabilities or mental illness -Those who could not complete the questionnaire, lack self-care ability and hospitalized.	-	Hemodialysis patients wiith comorbidities exhibited more severe levels of depression ($p<0.001$), anxiety ($p<0.001$), and fatigue ($p<0.001$), than patients without comorbidities. Fatigue restricts the patients from doing physical activity that leads to depression and anxiety and the study found that regular physical activity level reduces fatigue severity and fatigue interference.
Jona Sakiqi, et al (2022)[9]	To assess the factors related to depression and the impact of insomnia and fatigue on depression.	Crosssectional study/ Greece	100/ 18 - 85 years	Modified fatigue impact scale	Inclusion criteria: -Age 18-85 years old -on hemodialysis for at least three months -Able to speak, read, and write in Greek. Exclusion criteria: -Inadequate language skills -Aged over 85 years old -Cognitive decline -Drug or alcohol abuse	--	Depression is strongly associated with Insomnia and fatigue. An increase in physical and mental fatigue score increases insomnia that ultimately increases depression level of the HD patients. Insomnia also a predicting factor for fatigue.
Subrata Debnath, et. al (2021)[2]	To characterize and compare fatigue severity and fatigue interference with daily activities between dialysis and non-	Observational study/ United states	209/ No age criteria	9-item Brief Fatigue Inventory	Inclusion: (i) On thrice weekly hemodialysis for at least six months Exclusion (i) Patients with malnutrition and anaemia (ii) With Comorbidities such as acute cardiovascular events, active malignant cancer, refractory psychiatric disorders, and significant neurological disorders.	Severe fatigue was highly prevalent on a hemodialysis day than non hemodialysis day ($P = < 0.001$). 49% of patients have reported	Fatigue severity and interference is high on dialysis day than non-dialysis day. It positively associated with Age and depression. Negative Impact of fatigue affects the daily activities such as general activity, mood, walking ability, normal work, relations with other people and enjoyment of life ($P < 0.0001$) of hemodialysis patients on dialysis day.

	dialysis days.					fatigue.	
Zakariya Al Naamani, et.al (2021)[6]	To determine the prevalence of fatigue, anxiety, depression, and sleep quality.	A cross-sectional and descriptive correlational design/ Oman	123/18 years - No upper age limit	Functional Assessment of Cancer Therapy-Fatigue (FACT-F), Scale	Inclusion: -Adult aged over 18 years -On haemodialysis for at least three months -No known psychiatric or neurological disorders Exclusion: -Patients with cancer or dementia.	The study found the prevalence of fatigue is 53.7% among hemodialysis patients.	The predicting factors of fatigue are Ageing, being female, depression (7.9 times, p >.001), anxiety (6.3 times p >.001) and poor sleep (3.8 times p >.001).
Yukio Maruyama, et. al (2021)[10]	To compare the prevalence and severity of fatigue among patients receiving different dialysis modalities.	Cross-sectional study/ Japan	194/18 years – No upper age limit	Profile of Mood States (POMS), Visual Analogue Scale (VAS), and original scale of fatigue	Inclusion: -Adult aged over 18 years -Patients receiving Hemodialysis, Online Hemodiafiltration, Peritoneal Dialysis and combined therapy with PD and HD. Exclusion Criteria: -Under 18 years of age - Those with terminal cancer and any mental disorder, such as schizophrenia, depression or dementia.	The prevalence of severe fatigue was high on dialysis days for patients on Hemodialysis and Hemodiafiltration than dialysis free days.	The study found that the fatigue is the commonest symptom, and the different modality of dialysis treatment did not affect the presence of fatigue. Ageing, employment status, increased BMI and creatinine are the influential factors of fatigue. More than 80% of patients felt that the fatigue affected their work or daily life.
Astrid D.H. Brys, et.al, (2021)[11]	To assess in-depth understanding of' diurnal fatigue patterns and related variables using a mobile Health (mHealth) ESM application	Prospective observational study / The Netherlands	40/ 18 – 84 years	Fatigue severity scale & PsyMate mHealth App	Inclusion Criteria: - On haemodialysis for at least six months. Exclusion Criteria: - Adults less than 18years of age -Insufficient understanding of the Dutch language. -Inability to handle the mHealth application independently because of hearing problems, vision problems or insufficient cognitive skills -Diagnosed dementia; chronic fatigue syndrome; fibromyalgia -Actual instability of clinical condition requiring hospitalization.	68% of participants experiencing at least some fatigue.	The momentary predictors of Fatigue are HD treatment days, Less physical activity, depressed mood, and poor sleep quality.
Federica Picariello, et. al (2019)[5]	To evaluate fatigue severity.	Prospective Study/ UK	174/ 18 years – No upper age limit	The Chalder Fatigue Questionnaire	Inclusion criteria: - Adults aged 18 or older. - In-centre haemodialysis patients for 90 days or longer. - Able to speak or write English, - Willing patients. Exclusion criteria:	47.1 % of hemodialysis patients were clinically reported fatigue.	Fatigue was the predictive factor for increased risk of death (6% for one point of increased fatigue) due to distress, impaired functioning, and its consequences and it reduces the likelihood of transplantation (8% reduction one point of increase in fatigue) among haemodialysis patients.

					-Those with significant visual or physical impairment. -Any known cognitive impairments, serious mental health conditions (e.g. psychosis, personality disorder)		
Marit S. van Sandwijk, et al (2019)[12]	To compare fatigue, anxiety depression and Quality of life in patients with ESRD versus patients with a haematological malignancy undergoing chemotherapy.	cross-sectional cohort study/ Netherlands	168/18 years to - No upper age limit	The Checklist Individual Strength (CIS).	Inclusion criteria: -Age above 18 years of age. - On HD for at least 6 months. - Patients who undergone kidney transplant at least 1 year ago -Patients undergoing chemotherapy Exclusion criteria: -Active psychiatric or neurologic disease, previously diagnosed chronic fatigue syndrome, liver cirrhosis and an inability to understand the questionnaires. -For patients undergoing chemotherapy with brain metastases	53.3% of patients undergoing hemodialysis had very high severe fatigue than chemotherapy and kidney transplant patients.	High prevalence of severe Fatigue strongly impairs the quality of life of haemodialysis patients. (Correlation coefficient -0.58, P<0.001). HD patients have 23.4% of less quality of life. Anxiety and depression also impair the quality of life of HD patients. (Correlation coefficient -0.44, 0.57, P<0.001).
Astrid D.H. Brys, et.al (2019)[13]	To assess fatigue diurnal changes and its relation with depression	Prospective, observational study/ Italy	51/ 18 years - No upper age limit	Fatigue Severity Scale	Inclusion criteria: -All HD patients aged above 18 years. Exclusion criteria: -<18 years of age -Hearing or reading problems, -Dementia, actual instability of clinical condition requiring hospitalization, or active cancer.	-	The study found that fatigue increased significantly during the dialysis session. Patients also reported higher fatigue immediately before hemodialysis in the hospital environment than postdiaysis day ($F(1, 47) = 9.34$, $P = 0.004$, partial $n^2 = 0.166$) and found that individuals with high depression have higher fatigue than low depressive people before HD and on non-dialysis days.
Hanaa Hamdy Ali, et.al (2017)[14]	To assess the fatigue, depression, and sleep disturbances	Descriptive cross-sectional design/ Egypt	105/ 18 - 65 years	Fatigue Severity Scale (FSS)	-All adult patients undergoing hemodialysis for at least 3 months. Exclusion criteria: - Patients with concomitant diseases that prevent cooperation - Patients with history of psychiatric disease.	83.8% of hemodialysis patients had total fatigue symptoms.	HD patients have high prevalence of fatigue, sleep problems and depression symptoms and the study reported that fatigue (89.5%) affects the family and social duties of HD patients.37.1 % of patients also had severe depression. Aging and lower income are the positive predictors of fatigue. Fatigue and sleep latency are also positively correlated.
Zeinab Faried Bahgat. et.al	To assess the effect of fatigue on daily	Descriptive cross-section	100 / No age criteri	Fatigue Symptom Inventory (FSI) –	Inclusion criteria: - Adults both sexes undergoing HD Exclusion criteria:	41% of the patients have severe fatigue in	The study found that fatigue is negatively correlated with degree of daily living activities. Higher level of fatigue leads to decrease

(2016)[15]	living activities.	al design/ Egypt	a	Arabic version	-Patients with cancer, tuberculosis, human immune deficiency syndrome (AIDS), chronic heart diseases, liver diseases and patient on temporary HD.	first week of assessment.	level of daily activities such as loss of work motivation, difficulty of starting and finishing daily activities, loss of concentration, headache, and disturbance of sleeping. Females reported severe fatigue. Ageing, Longer duration of HD and three weekly sessions also increases fatigue.
Si Yuan Wang (2016)[16]	To assess and identify the risk factors of fatigue.	Multic entred cross section al study/ China	345 /18 - 82 years	Functional assessmen t of chronic illness therapy fatigue scale (FACIT-Fatigue)	Inclusion criteria: -Chinese citizens aged over 18 years who underwent routine hemodialysis for more than twice a week for at least 3 months. Exclusive criteria: -Patients with advanced or severe infection or malignancy, uncontrolled heart failure, intellectual problems or refused to participate	- High level of fatigue was reported among hemodialys is patients aged over 60 years.	The common significant predictors of fatigue among maintenance hemodialysis patients are Aging, poor sleep quality, bad social and family functioning, doing physical exercise less than an hour per day, comorbidity, Kt/V < than 1.2, and high serum creatinine level. (All $p<0.05$)
Sofia Zyga, et. al (2015)[17]	To investigate the demograp hic factors and the levels of fatigue.	Analyt ic study design/ Greece	129/ 18 years to No upper age limit.	Fatigue Assessme nt Scale (FAS) - Greek Version	The inclusion criteria: -Aged above 18 years -Undergoing hemodialysis for at least 6 months -Ability to write and read the Greek language fluently. Exclusion criteria: -Patients with history of mental illness -Patients with serious mobility or eye problems.	The prevalence of fatigue was reported to be 61% and among that 13.7% were extremely fatigue.	HD patients residing in urban areas, patients dealing with domestic work, low educational status, unemployment are the predictive factors of fatigue.
Tsiamis Georgios , et.al (2015) [18]	To investigate and correlate the levels of fatigue and quality of life.	Cross-section al design/ Greece	134/ 18 years to No upper age limit	Fatigue Assessme nt Scale (FAS)	The inclusion criteria: -Aged above 18 years old or more. -Able to communicate in Greek -Diagnosed with end-stage renal disease. -Cooperative patients Exclusion criteria: -Aged less than 18 years and not able to communicate in Greek	The prevalence of fatigue was 52.9% (10 <FAS <= 20) and among that 15% of patients had high to very high levels of fatigue. (30 <= 50).	The study proved that patients who experience high levels of fatigue had worse quality of life (MVQOLI total score 2.90) than patients with low fatigue ((MVOQLI total score 3.67) ($p<0.005$). Women have reported higher fatigue (0.19%) and most poor quality of life than men.

RESULTS

In this systematic review, the characteristics of 16 full text eligible articles published between 2015 to 2023 were discussed. These studies have been conducted in various

countries such as Greece, Brazil, China, United States, Oman, Japan, Netherlands, UK, Italy, and Egypt. Among these countries 4 studies have been conducted in Greece, [3,9,17,18] 2 from China [8,16], 2 from Egypt [14,15] and 2 from Netherlands [11,12]. Majority studies used Cross-sectional design. Prospective observational [2,5,13,11], Correlational[6], Analytical [17] and cohort [12] design were also used. Various fatigue assessment tools were utilised in these 16 full text articles. Three studies used the Fatigue Severity Scale [11,13,14], two studies used the Modified Fatigue Impact Scale (MFIS) [3,9], The Chalder Fatigue Questionnaire [5,7], Brief Fatigue Inventory [2,8], and Fatigue Assessment Scale (FAS) [17,18] to assess the fatigue level. Other studies used the various fatigue scales like Functional Assessment of Cancer Therapy-Fatigue (FACT-F) scale [6], Profile of Mood States (POMS), VAS and original scale of fatigue [10], The Checklist Individual Strength (CIS) [12], Fatigue Symptom Inventory (FSI) [15] and Functional assessment of chronic illness therapy fatigue scale (FACIT- Fatigue) [16]. PsyMate mHealth App was also used in a study to assess the fatigue level.[11] The study subjects ranging from 40 to 345, encompassing total 2187 patients, out of which 1881 patients received maintenance hemodialysis. The age variability of the patients was between 18 to 91 years, minimum age limit is 18 years and in most of the studies upper age limit was not specified. The mean age of individuals was between 49.5 to 67.3. Majority of the participants were males. Inclusion and exclusion criteria were varied based on the study purpose.

Prevalence of Fatigue

As fatigue is considered to be one of the commonest and a most complex symptom among patients undergoing hemodialysis, in this review its prevalence was found in the ranges between 41% and 83.8% [14,15], denoting a moderate to high level of prevalence. One study revealed that a high level of physical and mental fatigue was reported among patients over 70 years of age [3] and another study reported the same in patients over 60 years of age[16]. Two of the studies have reported that many patients suffer from severe fatigue on dialysis

days than non-dialysis days. [2,10]. One article discussed that patients undergoing hemodialysis reported very high fatigue than renal transplant or chemotherapy patients.[12]

Associating Factors of Fatigue

Based on the reviewed articles the associating factors have been listed out under five different aspects: Physiological factors, Psychological factors, Social factors, Dialysis/ Disease related factors and Changes in Biochemical Parameters. Physiological factors include Ageing, comorbid diseases, female gender, poor sleep quality, divorced/ widowed patients and less physical activity. Psychological factors are depression and anxiety. Social factors revealed to be low educational status, low income, domestic work, unemployment, bad social and family functioning, poor knowledge about the illness and living in urban areas. Dialysis/ Disease related factors are longer duration of hemodialysis, high body mass index, three weekly sessions, immediately before and during the dialysis, those feeling tired after dialysis and those who perceived changes in their body image. Changes in Biochemical Parameters include high serum creatinine and Kt/V < than 1.2. **(Fig. 2)**

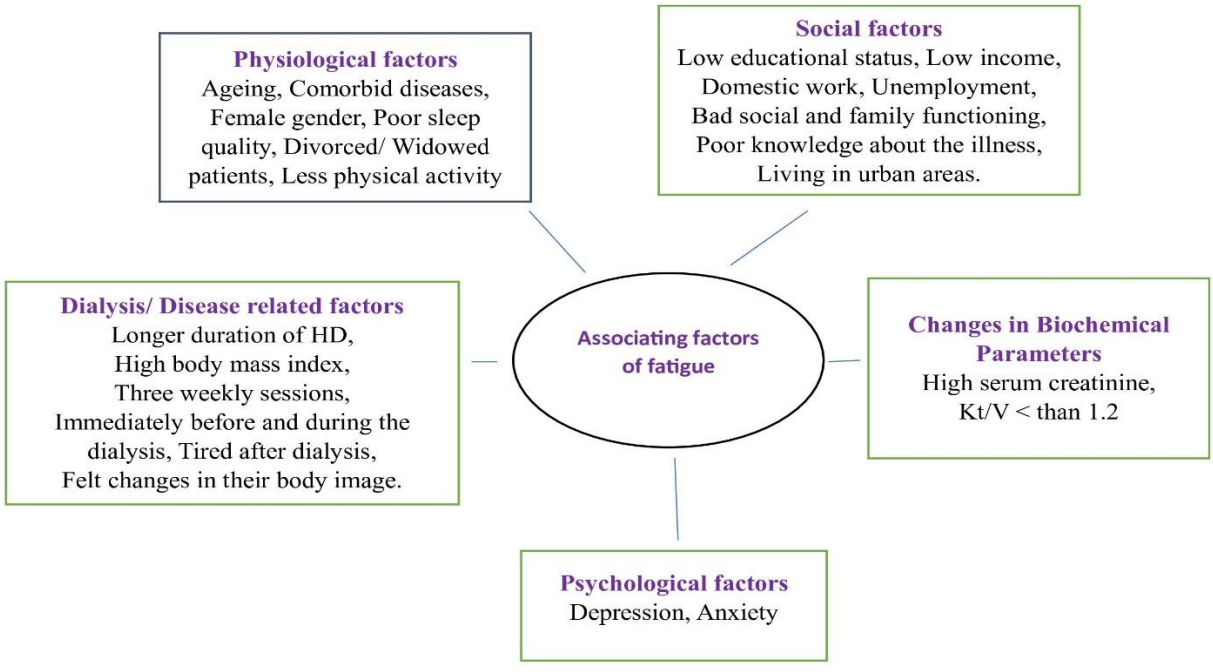
Physiological factors
Ageing, Comorbid diseases, Female gender, Poor sleep quality, Divorced/ Widowed patients, Less physical activity
Social factors
Low educational status, Low income, Domestic work, Unemployment, Bad social and family functioning, Poor knowledge about the illness, Living in urban areas.
Dialysis/ Disease related factors
Longer duration of HD, High body mass index, Three weekly sessions, Immediately before and during the dialysis, Tired after dialysis, Felt changes in their body image.
Associating factors of fatigue
Changes in Biochemical Parameters
High serum creatinine, Kt/V < than 1.2
Psychological factors
Depression, Anxiety

Fig 2: Associating factors of fatigue

Ageing is considered to be one of the main predicting factors of fatigue. Ageing over 60 years of age decreases the energy and the level of performance of patients undergoing hemodialysis [2,3,6,10,14,15,16]. Ageing and comorbidity among patients on hemodialysis have statistically higher physical and mental fatigue. Physical fatigue often reported as tiredness, general muscle weakness, intense body pain, headache, poor sleep quality, low physical activity, decreased physical and general health, disturbances in daily activities, decreased working capacity, difficulty in walking ability, social activity limitations that all increases mortality, restricted functioning, distress and consequences whereas mental fatigue leads to declined cognitive function such as loss of memory, impaired family and social functioning, mood instability, lack of work motivation, poor concentration, inability to remain focused under certain conditions and psychological distress like depression, anxiety, etc.[6,7]

Patients on hemodialysis with comorbid diseases have decreased physical activity and more depression ($p<0.001$), anxiety ($p<0.001$) and fatigue ($p<0.001$).[3,8] Women perceives more depression than men, which has more probability for fatigue.[7] Biochemical variations such as high serum creatinine and Kt/V < than 1.2, longer duration of HD, frequent dialysis session and high body mass index also leads to poor adherence of treatment by the patients undergoing hemodialysis which further worsens their condition.[10,11,16] Promising evidence suggested that negative factors like depression and anxiety also correlated with fatigue which furthermore leads to less physical activity and insomnia, which results in a cycle and further aggravates the depression and anxiety.[8,9]

Impact of fatigue

The reviewed articles reported that the presence of physical and mental fatigue among patients undergoing hemodialysis lowers their health related quality of life.[3,7] Multifaceted and multifactorial problems of fatigue affecting the physical and general health of patients on

hemodialysis than non-fatigue patients.[7] Fatigue severity and interference restricts the day-to-day physical activity of patients on hemodialysis.[2,8] There is a negative correlation between fatigue and activities of daily living and higher fatigue leads to difficulty in starting and ending daily activities, headache, lack of concentration, lack of work motivation and sleep disturbances.[15] Fatigue has a negative influence on patients' mood, socializing with other people and life enjoyment. It also reduces the patient's walking ability, general activity, and normal working capacity.[2] More than 80% of the patients on hemodialysis reported fatigue have restricted daily life and work. It socially affects their role and ability to cope with their families, work setup and social behaviours**.** [10]

This high prevalence of fatigue increases mortality i.e., as one point of fatigue increased 6% increased risk of death. This occurs due to restricted functioning, distress and consequences produced by fatigue. It is also reported that one point increase in fatigue decreases the likelihood of transplantation to 8% among patients on hemodialysis.[5] 89.5% of patients on hemodialysis with fatigue have impaired family and social function and it decreases quality of life to 23.4% than normal people.[12,14] Many literatures in this review suggested that the prevalence of fatigue is one of the main predicting factor of quality of life and daily functioning of patients on hemodialysis. It often leads to a worse quality of life and increased risk of death. [5,7,12]

DISCUSSION

This systematic review is mainly aimed at exploring the prevalence, associating factors and impact of fatigue on health-related quality of life of patients undergoing hemodialysis. As fatigue is the significant and multifaceted problem, this review identified the prevalence of fatigue was ranged between 41% and 83.8%. This result was consistent with the report of recent studies, revealed the prevalence of fatigue to be 69% to 77% [19] and

60-97%.[20] This more common general feeling of fatigue leads to general weakness, low physical activity, more dependency, and low functional capability of patients undergoing hemodialysis[3].

This review found that old age patients with comorbidity reported to have statistically significant higher physical and mental fatigue.[3] This may be due to ageing causes difficulty in adhering to the treatment which frequently detoriates their physical condition.[21] Fatigue is commonly reported among feminine gender as they are easily exposed to more frequent depression.[6,7,15,18] Depression is the commonest and significant predictor of fatigue that increases the level of physical and mental fatigue among patients on hemodialysis.[2,6,7,8,9,11,12,13,14] The prevalence of Depression among ESRD patients are reported to be between 20% to 40%.[27] Depressive patients suffer from sadness, loss of interest, less interest to eat food, tiredness and less concentration.[28] Negative impact of Depression leads to Insomnia and fatigue. Insomnia is also a predicting factor for fatigue. As physical and mental fatigue increases insomnia also increases that leads to increased depression.[9] Depression, poor sleep quality and less physical activity are considered to be the momentary predictors of fatigue among hemodialysis patients.[11] High depressed people have higher fatigue than low depressed haemodialysis patients.[13] Depression along with anxiety increases fatigue that impairs the quality of life of hemodialysis patients.[12] They frequently have anxiety about their dialysis regimen (66%) that ultimately leads to fatigue.[3,6,8,12]

Changes in the biochemical parameters like high serum creatinine and Kt/V < than 1.2 are the influential factors of fatigue as it leads to increased uremic symptoms.[10,16]. Poor sleep quality increases fatigue that lead the patients to use sleep medications which further worsens the fatigue, which may be the side effect of these medications.[24] The consequences of these physical and mental fatigue ultimately reduce their health-related quality of life, chances of

survival and even decreases the transplantation rate.[5,18] The transplant ineligibility occurs due to increased body mass index that is produced by the consequences of fatigue induced reduced functioning. Fatigue associated elevated levels of proinflammatory cytokines also reduces the chances of transplantation. [5]

Quality of life is the main predictor of determining health status of the patients on hemodialysis and it found to have negative correlation with comorbid diseases.[22] Aggravating fatigue may have effect on patient well-being and survival. It is also found that worsening fatigue have significantly high risk of all-cause mortality, first cardiac hospitalization, or cardiac death in maintenance hemodialysis patients.[24] This may be due to general cardiac causes like increased lipid metabolism, decreased heart rate, increased levels of proinflammatory cytokines and decreased fibrinolysis associated with fatigue among maintenance hemodialysis patients like general population.[25,26]

As many reviewed articles suggested that fatigue leads to impaired physical and mental functioning that reduces quality of life, but these studies lack detailed descriptions of its relationship with impact of fatigue. Studies also not been adequately explored with effect on family and social relationship, impact of post dialysis fatigue and the impact of other biochemical markers (Other than high serum creatinine and Kt/V) on fatigue. Improving fatigue in the end-stage renal disease population may positively impact patient well-being and survival. Longitudinal changes produced by fatigue also leads to increased mortality among maintenance hemodialysis patients.[24]

Highlights of this review on the prevalence, associating factors and impact of fatigue among patients undergoing hemodialysis, creates awareness of fatigue among patients and health care practitioners. Some of these risk factors are potentially modifiable, health care practitioners must need to recognize this earlier and complex problems created by it. The

interventions should be developed and implied clinically to find for coping measures to overcome the contributing factors. It further helps to evaluate and treat fatigue to reduce the prevalence. A multi-disciplinary approach to treatment and training for all renal providers is required to assess and address the impact of complexity of fatigue.

LIMITATIONS

Majority of the studies involved in this review are cross-sectional study and therefore, conclusive interpretations on causality cannot be drawn. Only one longitudinal study compared the relationship of anxiety, depression, and quality of life with fatigue, but other domains have not been described and compared. Moreover, the reviewed studies were conducted in various countries and have different inclusion and exclusion criteria's limit our ability to draw conclusions on physiological and psychological variables.

RECOMMENDATIONS

This review clearly states about the prevalence, associating factors and the impact of fatigue. This gives an overview to identify the different factors of fatigue and its impact among patients undergoing hemodialysis. Further reviews can be conducted on effect of Post dialysis fatigue, coping strategies to overcome the different contributing factors and complementary therapies of fatigue among patients undergoing hemodialysis.

CONCLUSION

Fatigue is the highly prevalent, complex, and the troubling symptom of patients undergoing hemodialysis, its limited understanding of associating factors and its impact leads to delayed interventions and consequences. Patients on hemodialysis suffer from physical, psychological, and social problems due to fatigue. Physical and mental fatigue increases the risk of mortality due to detrimental effects on quality of life among patients on hemodialysis.

The promising evidence of this review helps the health care professionals for early identification of patients at risk and intervene as sooner to prevent the debilitating effects of fatigue and improve health related quality of life. Health care professionals can verify different associating factors of fatigue among each individual hemodialysis patients and treat them to reduce its impact to enhance their activities of daily living. Further research is necessary in this area of inquiry on fatigue related factors on different domains of life and its impact on daily life. It also may help deepen our knowledge on how fatigue correlates with quality of life of patients on hemodialysis and factors affecting the physical, psychological and social health. Also, very limited literatures focussed on coping strategies and complementary therapies to overcome the fatigue. Therefore, further research should be targeted to develop more appropriate interventions to overcome the fatigue among hemodialysis patients.

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